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Paris and Scott's Four-Pole Dynamo.

We illustrate herewith a type of dynamo, introduced by Messrs. Paris and Scott, of the Gothic Works, Norwich, England, and containing some novel and interesting features.

The machine is a four-pole one, having opposite poles of like kind, but in other respects the arrangement of the field magnets does not call for any special mention, the real novelty of the machine being the method adopted for winding the armature, which is of the drum type. To explain this system of winding, it will be convenient to consider the armature as divided into four quadrants. Starting, then, from the center of one of these, and from the front of the armature, the conductor is laid along the latter parallel to its length, and on reaching the back is crossed over to the middle of the following quadrant, returning to the front of the armature along the median line of this quadrant. From here the conductor crosses to the third quadrant, and travels along its center line to the back of the armature, on reaching which it crosses to the center of the fourth quadrant, along which it returns to the front of the armature, and is carried to its original starting point on the first quadrant, thus completing the first armature coil. The second coil is obtained by carrying the conductor along behind the coil first put on, and this process is repeated till the whole drum is covered, when the end of the last coil is joined to the beginning of the first; the whole series thus forming one continuous conductor. The connections to the commutator are taken off as the conductor crosses the front of the armature. It will be seen from the above description that the conductor under one pair of poles is in series with that under the other pair, and consequently this machine only requires one pair of brushes.

In their most recent machines Messrs. Paris and Scott have modified the construction of the armature, with a view to diminish its magnetic resistance, though the method of winding, described above, is retained in all its essential details. In these newer machines, the body of the armature is 12 inches in diameter by 6 inches wide; along the cylindrical surface of this body, narrow strips of iron are laid, standing on edge, and extending the whole length of the armature, the diameter of which is thus increased to say 14 inches. The conductor is laid between these strips of iron, which are spaced apart for that purpose, these spaces being, however, very narrow, so that the armature presents what is practically a continuous iron surface to the field magnets.

Owing to the great reduction in the magnetic resistance which obtains with this method of construction, machines of this type for a given output are remarkably light; those for an output of 270 amperes at 100 volts, weighing only 17 cwt.; the electrical efficiency is also high, being put by the makers at over 93 per cent.

*** The long-distance transmitter and the Gilliland telephone are being largely adopted by the telephone companies for use on all toll and extra territorial lines.

The Pyromagnetic Generator.

To the Editor of Electrical Review:

I spent several years endeavoring to produce a practicable motor operating by the remarkable change of iron at a red heat, and brought the results of my investigations and my experimental apparatus before the Committee of Science and Arts of the Franklin Institute in the winter of 1884-5 for an advisory report.

The plan I proposed was the same as that adopted by Mr. Edison, namely, using laminated armatures, and alternately heating and cooling them above and below the critical temperature at which the magnetic change occurs. I filed an application for a patent in the year 1884, but was much discouraged by the fact that at the high temperature oxidation of the heated iron would occur, notwithstanding a coat of plating or enamel.

The idea of producing electricity upon this plan also presented itself to me; but as the same difficulty would have to be overcome, I considered it impracticable. I have, however, recently devised a plan for heating and cooling which prevents oxidation, and is applicable to a generator; and I am preparing an application for letters patent in which I will incorporate a certain feature of my motor, which I believe was original with me.

My investigations of the records brought to light an experiment of Prof. Gore, described in *Philosophical Magazine*, Vol. 40, p. 173, 1870, in which a rod of iron having a coil at each end, one being connected with a battery and the other with a galvanometer, generated induced currents when the central portion of the rod between the coils was heated and cooled.

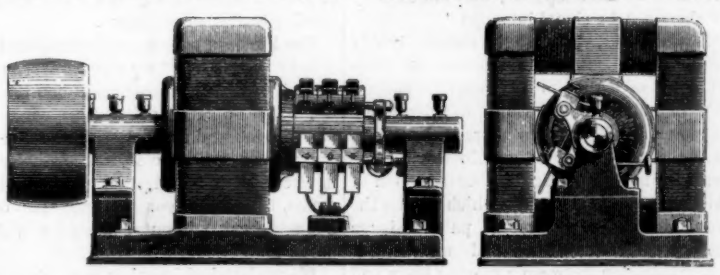
It is true that he was examining the magnetic change in iron, and not endeavoring to produce a generator of electricity; but his apparatus was a generator as truly as Faraday's wire moving across the lines of force was a dynamo.

WM. B. COOPER.

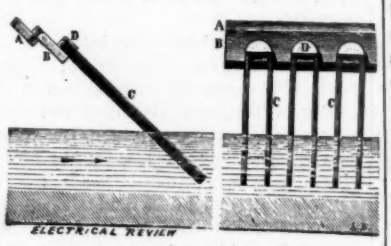
No. 517 Locust st., Philadelphia, Penn.

Electric Lighting in German Provincial Towns.

The public supply of electricity from central stations is not limited to Berlin only, but is beginning to obtain a footing in various provincial towns throughout Germany. A correspondent recently visited places where stations have been erected, the more important amongst them being the following: In Hanover there are two small stations already in activity, one for the supply of private customers and the other for the lighting of the Court Theater. In this case alternating currents and transformers are used, the transmission being by means of an overhead iron wire 100 mils. in diameter, at a potential of 1,200 volts. The total commercial efficiency of the system is 58 per cent. A larger central station with underground cables for the supply of the inner portions of the town is in contemplation. In Magdeburg there is a small central station for lighting a block of houses, including hotels and shops, in the neighborhood of the railway station, and in addition to this a separate installation for the theater is now being fitted up. There will be two gas engines of 35 horse power each placed in an annex, and the building will be lighted from the dynamos direct. The works of Gruson and Shäffer & Budenburg, in Buckau, have also special electric light installations. In Brunswick a private person has erected a central station for 1,000 lamps, all the lights being in a block of houses containing business premises. In Dessau, which is the headquarters of the Continental Gas Company, there is a very interesting installation which has been at work since last year, lighting principally the Court Theater and the Castle with about 2,000 lamps. Power is furnished by four Otto gas engines, two of them 60 horse power and one 30 horse power, working together on a counter shaft, from which two 600-light and one 450-light dynamos are driven. The fourth gas engine is an 8 horse power working a 100-light dynamo, which is used for charging a battery of Khotinsky accumulators, having a total capacity of 600 lamp hours. The cost of the whole installation was about £15,000.



NEW FOUR-POLE DYNAMO.



MAGNETS IN PAPER MANUFACTURE.

The Magnet in Paper Manufacture.

Manufacturers of paper and printers often suffer considerable loss from the fact that the dampening of the paper brings out little specks of iron rust which stain the paper. The iron gets into the paper by abrasion of the machinery used in its manufacture.

It is well known that magnets will often remove particles of iron from substances containing them. The *Papier Zeitung* announces the adoption of the principle in the manufacture of paper. Magnets *C* are arranged in the form of a comb, being fastened, as shown in the figure, to a strip of hard rubber *B* by the brass plates *D*, the whole mounted on a wooden support *A*. The magnets are hung across the stream of pulp and water, dipping well into it, so that it has to pass through the comb. The result is very satisfactory, and all floating iron particles are removed.

"INDUCTION TELEGRAPHY" DISCUSSED BY THE ELECTRIC CLUB.

MR. CHAS. A. CHEEVER READS A VERY INTERESTING PAPER ON THE SUBJECT—REMARKS OF OTHER MEMBERS OF THE CLUB.

The Electric Club held a very interesting and enjoyable meeting at its rooms in the Hotel Dam, Thursday evening, September 15. Before assembling in the dining parlors to enjoy the dinner and listen to Mr. Cheever's paper a meeting of the Board of Managers was held. A number of new members were elected, and action taken in relation to the purchase of furniture for the new club house. There was present not only a large local attendance, but a number of out-of-town members were warmly welcomed, among them being Mr. W. H. McKinlock, of Chicago; Messrs. R. F. Ross, W. R. Caulkins, and P. H. Alexander, of Boston; Messrs. C. C. Warren and C. D. Shain, of Chicago. Among those present from New York City were H. C. Davis, Geo. W. Hebard, Chas. A. Cheever, S. K. Dingle, Ph. Kobbe, Henry Hine, T. W. Parmele, Albert Taylor, R. W. Pope, H. L. Lufkin, Frank C. Mason, F. W. Toppan, Willard L. Candee, Andrew J. Dam, E. T. Gilliland, Geo. Worthington, John C. Tomlinson, C. O. Baker, Jr., T. J. McTighe, J. F. Kelley, Herman Hollerith, J. M. Brown, M. W. Goodyear, John Beesley, Geo. B. Coggeshall, F. Gottschalk, H. D. Hall, Geo. C. Lee, H. J. W. Dam, Chas. Dutton, E. F. Peck, J. N. Keller. Mr. A. E. Kennelly, of England, Electrician Eastern Telegraph Company, was present as a guest of a member of the club.

At the close of discussion which followed the reading of the paper, President H. C. Davis announced the progress that was being made on the new club house, and that the November meeting would in all probability be held in the new house on Twenty-second street. Mr. Alexander, of the Boston Electric Club, and Mr. Shain, of the Chicago Electric Club, were called on to speak, and both gentlemen responded, thanking the club for the courtesy and giving the listeners a brief account of the growth of these two new and vigorous electrical organizations. Mr. Shain announced that the Chicago Club had a membership of 125, and Mr. Alexander announced that the Boston Club had a membership of 116. Songs were given by Messrs. H. C. Davis and F. W. Toppan, and a recitation by Mr. John C. Tomlinson, all of the gentlemen receiving well-deserved applause.

Mr. Chas. A. Cheever was announced when the dinner was over, and was closely listened to as he read the following paper:

"INDUCTION TELEGRAPHY TO AND FROM BODIES IN MOTION."

In the use of the expression "Induction Telegraphy" in this paper which I have the honor to read before you, I intend to describe that method which consists of telegraphing from point to point without actual electrical connection between such points, and more particularly as such method of electrical telegraphy refers to the use of the same in communication between railroad

offices and trains in motion without actual continuous electric contact or connection between the sending and receiving points.

In this paper I shall confine myself almost entirely to the observations and experiences resulting from the introduction of this system of telegraphy by the Railway Telegraph Companies which I have the honor and pleasure of being connected with.

The knowledge of the phenomena of induction is as old as the scientific history of electricity, and most of its peculiar properties have been well known to electricians for many years, and many beneficial results have been obtained by the application and practical use of this, perhaps the most remarkable quality of electricity.

But until recently there has been no successful results, scarcely any attempts made to use induction for the purpose of telegraphic communication.

In the telephone, where there was really nothing new, wonderful results were obtained. Every one knew, who knew anything, that magneto electricity could be generated and transmitted by the vibrations of an armature in front of a magnet surrounded by a helix. Everybody knew that such electrical impulses received at the end of a long wire could reproduce corresponding attraction in another helix and magnet, for another armature, making it vibrate simultaneously with the armature generating the transmitted electrical impulses.

Everybody knew, who knew anything, that if these armatures were vibrated at a sufficient speed, that musical tones would be the result at the transmitting and receiving end.

Everybody knew, who knew anything, that the musical tones thus transmitted could be varied in their pitch according to the rapidity with which the transmitting armature was vibrated, and the consequent rapidity with which the receiving armature gave back its sonorous vibrations.

Everybody knew, who knew anything, that not only the pitch, but the quality of the tones transmitted could be varied by using different characters of transmitting armatures, or of the receiving armatures.

Now all this everybody knew, and have known clear back, and yet it is not clear back, when by combining these elements (all well known) has been accomplished the most wonderful demonstration of electrical result ever produced in a single instrument—the speaking telephone.

After years of experimenting of many eminent electricians, striving to obtain this very result, the telephone is suddenly brought before an astonished world perfected, not by any additions of new elements or mechanical devices, but using only those known since the various rudiments of electrical science were known, and by their adaptation in the form most simple producing an instrument most perfect in its work.

Like the little child's, the voice of the telephone was weak when it first spoke to the public, but its voice has remained the same, but grown more strengthened and more cultivated by the interested nursing and teaching of all electrical scientists, until now the educated telephone of to-day is most perfect in its speech.

The same history can be given on induction telegraphy; every element used has been known for years. Many and valuable applications of inductive electricity have been made, and for years many beneficial and valuable results have been obtained. Various attempts and experiments have been made to apply its use in various ways for telegraphic communication, but it is only until very recently that attempt has been made to use its principle independent and alone for the production of telegraphic communication without electrical connection between points intended to be in communication with each other.

Perhaps the introduction and general use of the telephone has been indirectly a moving incentive to inventors to apply this principal to telegraphy.

The very fact of the trouble which induction has been in the practical use of the telephone, has brought to the minds of electricians, the idea of making use of this branch of the business.

The frittering and frying noise of the telephone at times has been one of its greatest enemies and the study of electricians to overcome or counteract its disastrous effects in the telephone service, has kept more constantly before them this branch of electricity not previously so much thought of, but lately so much disliked on account of its bother to the business of the telephones.

By reference to the various lectures, papers, books and essays on telegraphic communication, it is found that almost constant reference is made to this matter of induction, but strange as it may appear, until recently but few have thought of utilizing this effect, and by turning the bad into good, make practical, useful and of benefit, that peculiar effect in electrical telegraphy which before they regarded simply as an obstruction to be got rid of.

The first practical adaptation, or at least result, which was brought to the attention of the public of a beneficial utilization of induction electricity to telegraphing, as far as I know, was that of Wm. Wiley Smith, in a U. S. patent granted to him in 1881, and almost undoubtedly the subject was brought to his particular attention from his intimate connection with telephone business with which he was a prominent and practical introducer.

Shortly after—but almost simultaneously and entirely independently and without knowledge of the results obtained by Wm Wiley Smith—Lucius J. Phelps also conceived the idea of turning this electrical "bug" (to use the term which I believe was electrically originated by Edison) into a useful creature capable of giving benefit to the world.

Apparently without knowledge of the work of Phelps and Wiley Smith, another Smith, Willoughby Smith, president of the Society of Telegraph Engineers and Electricians of Great Britain, in a lecture on volta electrical induction, delivered to that Society on November 8th, 1883, says:

"Telegraph engineers and electricians have done much towards accomplishing the successful working of our present railway system, but still there is much scope for improvements in the signaling arrangements. In foggy weather the system now adopted is comparatively useless, and recourse has to be had at such times to the dangerous and somewhat clumsy method of signaling by means of detonating charges placed upon the rails. Now it has occurred to me that volta induction might be employed with advantage in various ways for signaling purposes. For example, one or more wire spirals could be fixed between the rails at any convenient distance from the signaling station, as that, when necessary, intermittent currents could be sent through the spirals; and another spiral could be fixed beneath the engine or guards' van and connected to one or more telephones placed near those in charge of the train. Then, as the train passed over the fixed spiral, the sound given out by the transmitter would be loudly reproduced by the telephone, and indicate by its character the signal intended."

Having thus, to a slight extent, briefly suggested in outline the course of ideas which have led up to the practical adaptation of inductive electricity to telegraphic purposes, I will now go more into detail as to the results obtained within the last few years, by actual practice and introduction of this branch of telegraphy, which, to use the words in one of the recent patents, is "a method of establishing and maintaining communication between a moving body and a fixed station, by means of electrical induction as distinguished from electrical contacts."

Electrical science has made a distinction between that known as dynamic induction, or that caused by an electrical current, and that known as static induction, or that caused by electricity at rest.

In many instances the effects of the manifestations produced by either of these branches are similar; in some instances they differ; but I believe it is still an open question between electrical scientists as to if, in reality, there is an essential difference between these two different phases of inductive action But such differences in the phenomena produced as there may be, and such differences in the apparatus and method of producing these different phenomena as are best known, are the differences between the application of inductive electricity as made by Smith, and as made by Phelps.

Smith employs that method which is commonly known as static induction, and Phelps that method commonly known as dynamic or current induction.

Without going into a scientific definition of static induction, what I mean is that effect of inductive electricity caused by the effect of a charge of electricity upon a condensing surface held to a given tension, opposite to another and similar surface in its neighborhood, and which is called "static induction," because it is not a result of a current of electricity, but simply of a charge upon one surface, which binds or holds a charge on another surface opposite in its character istics or potential to that of the first plate; and this charge is permanent upon both, so long as no disturbance of the potential is made in either plate; but when a disturbance upon the potential is made, by opening or closing the circuit in connection with one plate, a similar disturbance of the potential in an opposite direction will occur on the opposite condensing surface, which would continue as long as the disturbance of the potential in the first plate continued.

It is in a practical application of this phenomena that Wm. Wiley Smith depends for the production of telegraphic communication by the method described in his invention.

According to Smith's plan, a wire is strung along the line of the railroad so as to come as near as possible to the top of the cars as they pass along the track. This wire is connected, at the terminal or line station with the proper instruments and batteries, and so connected, forms practically one condensing surface of the system; the metal roof of the car is the other condensing surface, and is connected by wire through suitable instruments and batteries and to a ground *via* the wheels of the car to the rails, and thus an inductive electrical communication is established either by electrical impulses sent from the stations along the line, and thence by static induction creating an electrical impulse through the car roof and instruments to the ground, or *vice versa* from the car roof to the line.

In the definition of the causes and effects of dynamic or current induction, I desire to be equally as unscientific in my observations as I was in describing the static branch of the matter, and would suggest that current induction may be said to be that phenomenon produced by an advancing wave of electricity in a conductor, causing, by induction, a sympathetic current in the opposite direction on a parallel wire placed in its proximity.

It is a practical application of this phenomenon upon which Mr. L. J. Phelps depends for his method of the production of telegraphic communication without contact or ground connection from a fixed station to moving bodies, or *vice versa*.

The Phelps apparatus as first utilized consisted of a line wire connected with suitable batteries and instruments, and upon the moving body or car a coil whose wires were placed near and parallel with the line conductor, and which coil was connected up in circuit with batteries and suitable instruments, forming a complete metallic circuit upon the car without connection with the ground.

When electrical impulses were thrown upon the line wire they caused counter electrical impulses to be induced upon the coil and instruments in connection therewith upon the car, and when the circuit in the coil upon the car was opened and closed, the inductive effects of the current in the coil were induced in opposite directions upon the line wire, and thus transmitted to the line station.

In actual practice an insulated line wire suitably protected and laid midway between the rails was found most desirable, and upon the car a coil extending in length from truck to truck and in width as near as possible to the insulated line wire on one side, the car roof on the other, this form of coil being for the purpose of giving the greatest effect of inductive influence on one side of the coil without counteracting the effect of the influence on the opposite side of the coil.

Experimenting has been extensively carried on in both systems to produce the most practical and substantial results both individually and also, as far as possible, to the utilization of the best qualities of each, in order to obtain the most perfect combination of system.

The instruments used in the operation of induction telegraphy are substantially the same whether for the static or dynamic principle, and whether for the stationary or moving office. The resistance of induction coils of transmitters and helices of the receivers may be varied with more or less beneficial results, according to which method of induction is employed.

The instruments consist of a battery of an induction coil and rheotome circuit brake, preferably combined in one instrument, and of a telephone receiver of the ordinary pattern, and of a double contact point transmitting key.

I do not think it would be of interest to detail the many experiments that were made, with every conceivable form of coil and telephone; of battery and magnetic machine; with wires at various distances from the railway track; with wires used in ordinary commercial service with the train telegraph system superposed thereon; with wires under the track, by the side of the track and but a few feet from the ground; and finally a wire on sixteen-foot poles and distant about 8 feet from the track.

In using the induction coil we are not compelled to use a secondary winding; a simple primary coil does very well when the line wire is close, but for general use the secondary winding has proved the most serviceable. Nor are we obliged to confine ourselves to the use of an induction coil at all. A small magneto-generator, specially wound, will produce the tension required, and thus obviate the necessity for either battery or coil; at present, however, 12 cells of chromic acid battery are employed; the cells are of rubber and are about $2 \times 3\frac{1}{2}$ inches across by about 4 inches deep.

The primary of the induction coil as now used, measures about 3 ohms, the secondary about 500. The receiving telephones for the train measure about 1,000 ohms; those used in the fixed station about 250, though very good work may be done with an ordinary Bell phone at either point. The results attained with telephones of from 700 to 1,100 ohms resistance make it practicable to work with the static method with but a single car roof.

Ohms' law seems to apply to a certain extent in the working of the system. The resistance of the air between the two condensing surfaces is of course enormous, hence the greater the number of convolutions of wire around the core of the receiving instruments that can be made, so as to be really effective, the better the result. At present we find that 100 ohms gives the best results.

While 12 cells of battery is much more than is really required for good work, yet the vicissitudes attendant on the use of voltaic elements makes it necessary to have excess over the amount actually needed.

Speaking of insulation, the question naturally arises, how do you get along in wet weather? We have worked in all kinds of weather, and find that in the case of car roofs that the difference is so slight in a damp, foggy and misty atmosphere with a warm rain, that it is hardly perceptible, and without making a close test, we have concluded that the improvement made by the rain in the matter of ground contact more than compensates for loss by reason of leakage in the damp atmosphere.

When it is practicable to use the wires already constructed along the line of a railway and connected with telegraph offices in the way stations, it is necessary to bridge the Morse apparatus with high resistance

coils in such way stations or to shunt them with condensers, in order to preserve the continuity of the circuit for high tension vibrations of the train telegraphy when the Morse keys are open.

While harmonious vibrations are employed we are by no means confined to the use of them; the click of the Morse sounder is easily imitated by the use of a combination similar to that of Edison's phonoplex; in fact, the phonoplex works very well when employed for this purpose.

The ordinary Morse system of operation can be used with induction telegraphy, the only necessary requirements being a polarized relay of sufficient delicacy of operation, and a larger battery than that for the vibratory method. In fact, when the Phelps system was first operated upon the Harlem River branch of the New Haven Railroad this method was used almost exclusively—a special polarized relay for great nicety of adjustment, and particularly as to resistance adapted best to the high tension of the induced current—a local sounder connected with the relay in the ordinary manner. There was no difficulty in making this operate at all times in a satisfactory manner, but the continuance of its use was afterwards abandoned, for the reasons—first, that the operators preferred the easier manipulation of the receiving telephone, which did not make it necessary for them to watch the delicate adjustment required by the relay, and secondly on account of the great economy effected by doing away with the large battery which was necessary to obtain an induced current of sufficient strength for the operation of the relay.

I have not taken your time with the discussion as to the various uses and advantages which may be obtained by the induction telegraphy, nor as to the numerous improvements which I know to be under experiment and outline for the future. Arrangements are already perfected whereby duplexing, or even quadruplexing, may be accomplished. Experiment has been made for transmitting articulate speech to and from moving trains, and whether this can be reduced to a practical success remains to be seen. As far as we have gone, we have met with encouraging results with the line wire situated eight feet distant from the moving car.

There seems to be no reason why, with the proper adaptation of the elements employed, communication between ships could not be arrived at. Telegraph line wires may in the future be laid through our rivers and sounds, and with suitable coils upon the boats moving up and down the streams, communication may be had with them.

Edison, Gilliland and Phelps have all experimented in the direction of ship telegraphy, and the results give great encouragement of ultimate practical success

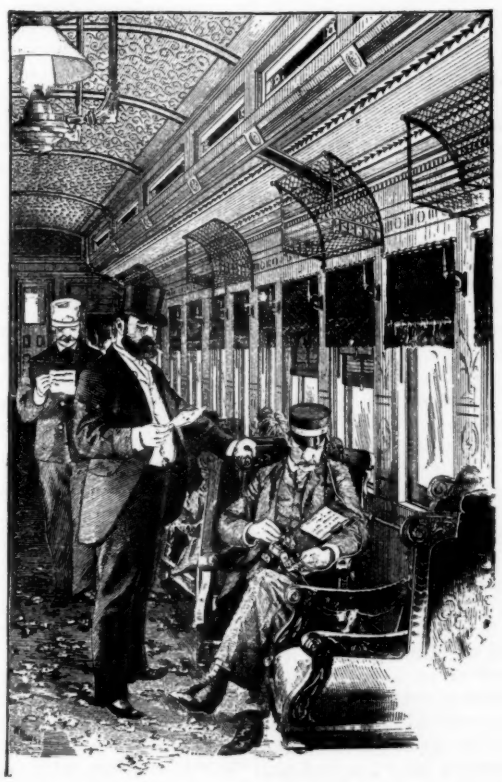
To conclude, while the results are now all that can be desired for telegraphic communication to and from railroad trains, there is still a vast field of other uses for induction telegraphy yet open for experiments to make them practical and useful.

Mr. Cheever stated that any questions concerning the practical application of the system would be answered by Mr. Dingle, who was engaged in the work of introducing the system on the railroads.

The Discussion.

Mr. S. K. Dingle (assistant superintendent of the Consolidated Railway Telegraph Company) was called on, and said that the same apparatus was applicable to both the dynamic and static systems. It is but just to say that the plan originally laid down by Messrs. Edison and Gilliland for operating this system is the one in use at the present time. The only changes made have been in the form of apparatus. To apply the coil which is constructed specially for static work to the dynamic system, all that is necessary to do is to throw out the secondary, and use the primary, with its rheotome as a part of the coil circuit, which is wound around the car used for telegraphic purposes. Referring to the static system, in the matter of the readiness with which it could be applied, were I called upon to-night to accompany a railway magnate as an operator over his division of the road, with a car which had not previously been equipped, all that it would be necessary for me to do to make that car practicable for telegraphic purposes would be to pass an office wire out of one of the windows, and to twist it a few times around one of the pedestal boxes of a truck for the ground; I would then attach another wire to the stovepipe, or the zinc lining around it. This would give me my roof connection, as a stovepipe is always in intimate social intercourse with the roof, which is our condenser surface. This would complete the connections of the car and would only further require the joining up of my telegraphic apparatus. The whole matter of fitting up the car in this way would not take over three minutes. It works very well, indeed, and only failed us once, when we discovered subsequently that the upper joints of the stovepipe had been removed, and we were consequently, for the time being, left.

Mr. H. D. Hall (Secretary of the Consolidated Railway Telegraph Company): Mr President, I do not think it possible to add anything to the very complete and felicitous description of "Induction Telegraphy, as applied to communication to and from moving vehicles," which has just been given us by Mr. Cheever. I would like to say, however, that it is extremely difficult for the mind to arrive at a full realization of the scope and practical value of this very interesting and wonderful application of electrical inductive action without some practical demonstration, or illustration; to do this, one should be actually seated in a rapidly moving railroad train, gliding over the rails, say at a rate of speed of fifty to sixty miles an hour, and holding at his ear a telephone, and hearing the clear resonance of the interrupted harmonic waves to the trained telegrapher's ear, representing speech, electrically spoken, 60 or even 100 miles distant; and then to place his finger upon the sending key, at his hand, and thus hold an animated conversation with a friend at some far distant point; and then, suddenly casting his glance out of the car window, observing the rapid, advancing motion of the train, he also sees a long, slender, silvery line of telegraph wire, suspended upon poles, parallel with the way upon which he is traveling; he further observes that this wire is distant at least from ten to twenty feet from the train which so swiftly is bearing him toward his destination; and then knowing that this speech, just had with his friend at the far distant station, was transmitted



Induction Telegraphy on the Lehigh Valley Railway.

along this very wire, and to him through the clear air space of from ten to twenty feet, by purely inductive action, without the remotest possibility of actual metallic contact—he then begins to realize what a marvelously wonderful thing this "induction telegraphy" is. As his thought continues to dwell upon the matter, there is produced upon his mind a sensation almost weird-like.

In order that the members of our club may have an opportunity of inspecting and testing for themselves this practicalization of telegraphing to and from bodies in motion by the means, and solely by the means, of "inductive electrical action," I have the pleasure and honor, by authority of the Board of Executive Managers of the Consolidated Railway Telegraph Company, of inviting the members of the Electric Club to visit the New Jersey division of the Lehigh Valley Railroad, upon which this company has inductive telegraphy in actual daily operation, sometime in the early part of October. Through the kindness of Mr. H. Stanley Goodwin, the general superintendent of the Lehigh Valley Railroad, and Mr. J. W. Lattig, the telegraph superintendent of said road, we have arranged that several special passenger cars will be attached to the regular train, leaving New York at the foot of Cortland street at 1 o'clock P. M., arriving at Easton at 3.45 P. M., and, after allowing for a stop of about 15 minutes at Easton, at once returning, arriving at New York at 6.30 o'clock P. M. Special tickets of invitation and passes will be in the hands of the secretary of the club, and it is especially requested that all members of the club who contemplate kindly favoring us with their presence upon this excursion (which we will endeavor to make both an enjoyable and an interesting one), will send their names to the secretary of the Electric Club, Mr. Chas. W. Price, 13 Park row, at any time prior to the date of the excursion, which will be exactly fixed within a few days.

Mr. T. W. Parmele inquired as to the range of the induction system—what length of line it could easily cover.

Mr. Dingle: It will depend on the situation. The distance of wire from the track, its conductivity and electro-static capacity must all be considered. On the New Jersey division of the Lehigh Valley Railroad we have a special wire of No 12 steel, distant from the nearest track eight feet, and from the further track about twenty feet. This works very well indeed. In our experiments in the West, on the Western Division of the Chicago, Milwaukee and St. Paul railroad, between Para, Iowa, and Council Bluffs, we worked excellently 80 miles, 100 miles we worked fairly, and for the remaining 23 miles of the division, by dint of hard listening, we were enabled to send and receive dispatches. This was on an ordinary telegraph line, the entire length of which was over 200 miles, with twenty-one telegraph offices on the division over which we worked. The Morse apparatus in each of these offices was shunted by condensers in order to preserve the continuity of the circuit when the Morse keys were open. Their capacity was about one micro-farad each. We would have attained better results with condensers of double that capacity. The average distance of the wire from the car was from twenty to forty feet. While we did thus well under the above conditions, we prefer to have the wire as close as possible and as free as possible from other apparatus. On Sept. 7 we fitted up a work train, using for the purpose a cord or cable of brass wire twisted spirally around a hempen cord, and covered with insulating material. This cord was wound upon a drum, and from it was run out upon pulleys placed on the top of uprights, which were fastened to the sides of the "flats" or "gondolas" of the work train, by means of the iron sockets attached to their sides. The high insulation of this arrangement enabled us to do very excellent work, averaging better than when the roofs of passenger cars were used. Orders were sent to the work train, and its movements controlled perfectly, while either standing in the cuts being loaded, or in motion from point to point. On one occasion during a heavy rain storm I made special effort to note if there were any difference in the working margin as compared with the work done one hour before the shower had commenced, and though the water was running in little rivulets down the sides of the upright supports, I failed to discover any falling off in the working margin.

Mr. A. E. Kennelly, London, England, electrician of the Eastern Telegraph Company, was called on, and, after thanking the club for its courtesy, stated that he was visiting this country for the purpose of seeing what was being done electrically over here. He had been greatly interested in Mr. Cheever's paper, and had to confess that no experiments in this direction had been made on his side the water. It did not occur clearly to him how, if better results were desired in the static system, it could be brought about; he could readily see that by increasing the convolutions of the coil, an increased inductive effect might result in the use of the magnetic system. This point he would like to have made clear.

Mr. Dingle said that, as a pupil of Messrs. Edison and Gilliland in this line of work, in all technical matters he preferred they should answer, and asked Mr. Gilliland to reply.

Mr. Gilliland in effect replied that there were two ways of increasing the available working margin of the static system—one of which is to increase the sensitiveness of the receiving instrument, and the other to add to the extent of the condensing surface. Thus if one car should not give sufficient working margin by reason of side tracks intervening between the line and train at different points, we have but to add another car roof, doubling our surface and increasing the inductive effect. This is not necessary when the receiving instrument is of sufficient sensitiveness. We have at present a telephone receiver which makes practical work with a single roof with a line two tracks distant from the car used.

Mr. Frank Mason inquired if there were any means of calling the train operator, should he not wear the receiver on his head. Was it necessary to have the operator always chained to the apparatus?

Mr. Dingle: I think it a very desirable thing to have the operator so chained. My friend, Mr. Mason, as a practical telegrapher and superintendent, will probably recall the difficulty the chief operator has in raising an office in time of emergency. I remember very distinctly on the occasion of the assassination of President Garfield, that the Western Union Telegraph Company would have distanced all others in the matter of disseminating the first news of that sad event had the operator at the nearest point in Washington been at his post; as it was, a smaller company with much less facility, but whose operator was wide awake and at his post, sent out the first dispatch, distancing their great competitor at least twenty minutes. When a train dispatcher wants a train he wants it at once, and with the operator at his post all necessary instructions may be given without delay.

Mr Gilliland called attention to the fact that the operator on the train, by the use of the flexible cord attached to his telephone, was enabled to move about within reasonable limits with the utmost freedom, and in no way prevented from doing other work that might be necessary in the checking of baggage or the delivery of a message.

Lieut. Toppan called attention to a singular phenomena in connection with the working of static induction, stating that in crossing the iron bridge which spans the Mississippi river between Minneapolis and St. Paul, and which is several hundred feet long, with the wires a number of feet below the bridge, there was no apparent falling off in the inductive effect, and the operators were able to work as well at that point as anywhere else on that branch of the Chicago, Milwaukee and St. Paul Railway.

Mr. Dingle stated that that was a condenser action, referring to the experiment of bound electricity upon a condenser surface in the immediate vicinity of an electrically-charged surface, where several successive insulated surfaces may be charged inductively.

Mr. Geo. W. Hebard inquired if the system was in practical operation at the present time, and was informed that it was now in daily use on the Lehigh Valley Railway.

Practical Application of the Induction Telegraph.

The illustration presented herewith shows one of the operators of the Consolidated Railway Telegraph Company on his trip in a parlor car on the Lehigh Valley Railroad, making use of the induction telegraph which was described by Mr. Chas. A. Cheever before the last meeting of the Electric Club. In the illustration the sending apparatus is shown in the operator's hands, the receiver being attached to his ear. He can be placed in any car, but the intention is, we believe, to have him located near the middle of the train, so as to accommodate the greater number of passengers.

—— The Los Guilicos Water, Light and Improvement Company, of California, has been incorporated for the purpose of acquiring real estate, and to supply water, gas and electric light and power for public and private uses. The capital stock is $250,000. The directors are J. M. Donahue, N. W. Griswold, A. S. Rhorer, W. H. Matthews, of California, and Henry N. Bird, of Cincinnati, Ohio. The directors take stock to the stated value of $61,250 each, excepting Matthews, who takes 100 shares, valued at $5,000.

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EDITORIAL ANNOUNCEMENT.
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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Frank M. Gilley, 54 Equitable Building, Boston, Mass., is our New England representative.
Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West
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NEW YORK, SEPTEMBER 24, 1887

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The Electric Club 'opes to be at 'Ohm next month.

When the subways are completed New York will have another handle to her name, and Jerusalem and Rome will not then be the only Holy Cities.

You may talk of your fundamental units, your volts, amperes, watts, feet, seconds, etc., but it strikes us the all potent unit of this "business end" of the nineteenth century is, more than ever, the almighty dollar.

ELECTRIC DINNER MOT.—A veteran confiding his troubles to a friend, said: "Away back in the old days I used to get along first rate with my batteries, but since they've taken to putting in these goldarned newfangled volts and amperes, blamed if I can do anything with them!"

The very ingenious water resistance used in the Field motor was first used by Mr. Field for distributing power in San Francisco in 1879. Attached to it was an Edison electric pen, a dental plugger, and an induction apparatus in a physican's office. It was used to reduce the current from a dynamo at a central station, the current from which was carried over the roofs of houses by a No. 9 wire.

An engineer (?) who had been just promoted from hall-boy to the care of the dynamo in a Western city hotel, was told by the inspector one night there appeared to be too great a load on the engine, and it should be tested with a dynamometer. Next day the engineer went to the proprietor, reported the inspection, and said the inspector had let him off easy, as he only wanted "a dime thermometer to taste the lights with."

The annual convention of the National Telephone Exchange Association commences next Monday, Sept. 26th. It will be held at the Monongahela House, Pittsburgh. The chief topics of discussion will be underground service and long-distance telephoning. The new wire gauge, which was received with favor by the National Electric Light Association, will be presented and discussed. Mr. A. V. Garratt, chairman of the committee of the Electric Light Association, has been invited to be present.

As Mr Cheever well said in his paper before the Electric Club, there is a vast field opening up for the use of the induction telegraph We know of no recent electrical work which promises so much for the future, in addition to the successful applications for important railroad use already made. The wide-awake promoters have accomplished most important results, and are to be congratulated on the success that has attended their efforts. We expect to see some very remarkable and valuable applications of inductive telegraphy in the near future.

"Electric cocktail" is the latest. A flexible lead from the electrolier ends in a platinum curl. A trifle of sugar is added to the liquid, the platinum curl lowered into it and current turned on to make the curl red hot. A small amount of the alcohol and sugar is decomposed, *i.e.*, carbonized, and the resulting burnt sugar flavor is said to be very delicate. It promises to be a fashionable winter beverage, and can be made cold or hot.

(Query—Is this not *hydrocarbon treating* and an infringement of the Sawyer-Man patent?)

The Field motor was given a trial trip on the Thirty-fourth street branch of the New York elevated road this week. The motor easily accomplished all that was required of it, the test proving entirely satisfactory to the inventor, who is, in this rare case, a most severe critic. In a recent issue of the REVIEW, the Field motor was exhaustively described and illustrated, and is therefore familiar to our readers. Its adoption by the entire elevated system is, we presume, only a question of proving its adaptability for handling the immense traffic to be met with in this city. And this, we think, will soon be proven.

LONG-DISTANCE TELEPHONE WORK IN EUROPE.

According to a pamphlet received from Société Belge d'Electriciens, the Van Rysselberghe anti-induction system for the simultaneous transmission of telegraphic signals and telephone messages has made great strides since 1881. The following table gives the total length of wires now used in this system.

Germany	1,032	kilometers.
Austria	288	"
Bavaria	600	"
Belgium	7,206	"
Spain	140	"
France	4,044	"
Netherlands	386	"
Switzerland	536	"
Wurtemberg	880	"

Besides these, about 6.000 kilometers are being fitted out to work the system, or a total of about 21,000 kilometers—about 13,000 miles. The longest line is from Paris to Marseilles—435 miles.

OUR CHICAGO LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

Colorado, as far away as she is from the conservative East, seems to be making a lively stir in electricity and kindred, or perhaps accompanying appliances. They have their own systems of electric railroads out there, their own ideas of how to run plants for illumination, and it is not quite certain that they will not in the near future establish a wire gauge of their own, and be, as an Englishman said the other day, "hindependent in their new ohm." What brings all this matter to the front just at this time is the fact that the Underground Electric Conduit and Water Pipe Company, of Denver, Colorado, my "Denver correspondent informs me," is about to start its manufacturing plant at the corner of Blake and Nineteenth streets for the furnishing of underground conduit for wires. The Electric Light Company there has already several miles of this laid, and is putting down more. The material is much the same as the Dorsett, the outer case being built of perpendicular sides with curved top and bottom plates, so that a cross section of the conduit has the shape of a rectangle with the corners rounded off. Within this a slab of the same material is placed, having grooves in its upper surface, where wires are laid. Another slab and more wires go on this, and so on, until the box is full, when the cover is placed over the whole. There are no man holes, as the conduit is to be placed quite near or at the surface of the streets, and the cover is readily removable. The patents are those of Messrs. Street and Crowell, and the system is said to work perfectly for electrical or sewage purposes, for which latter it is also sold.

On the dandy little seals that the little ducky dudesses use on their little tootsy-wootsy notes to their dude friends there are various too-cunning mottoes. Among these is one which took the first prize at a late fair, and originated in the brain of a shoemaker:

"Long looked for—come at last,"

and its appropriateness at the present juncture is so pat that the reader will hardly fail to perceive, as the advertisers say, "that we refer to the lately discovered, and altogether unique emanation from the fertile brain of" two young chaps away down East. It is of the "children cry for it" style of telephone, genus 'umbug, species a-cow-stick. It will only repeat or carry what is especially addressed it, no matter what other words or sounds surround it, and delivers only proper messages; skips all hard words and language which tastes unpleasantly, or has a vile smell. As an illustration, it is mentioned of it, that Deacon Smith, who is a most exemplary member of the Congregational church at Smith's Crossing, was unable to get a word over the blessed line. Several attempts were made, but all were decided failures. Finally, one of the inventors took the Deacon's place and elicited the fact that the Deacon's breath was so redolent of Weathersfield onions and navy plug that the puritanic and sweet-minded little telephone wouldn't carry his words. The distance between the speaker and the transmitter is, as Mr. Toots told Miss Susan Nipper on a certain occasion, "a matter of no consequence." Anywhere from a foot to a mile and a half, with a row of brick houses between, is a good place for the speaker, and the listener, if in a direct line at right angles to the wire, above, below, or on either side, may be still farther away.

No objection can be urged on the score of possible eavesdropping. This telephone never answers the wrong party, never gives away any secrets, and as a family appliance far surpasses either the Bell or the other. It is useless to add that the new telephone uses neither electricity nor magnetism. It bears some similarity to the church which was once organized in Posey County Ind., one of the fundamental laws of which was that neither politics nor religion should be preached by its reverend leaders. There are still a few shares of stock for sale to accommodate scientific investigators.

During the annual exodus of people who leave comfortable houses to spend a season of unhappiness and swindle at some fashionable resort, where they can accomplish their daily pickling in the briny deep, a gentleman of Chicago arranged with one of his clerks to sleep at his residence during his absence. So the substitute and his little blonde wife moved over after the limited express had carried off the millionaire and his hindrances, and anticipated a nice, quiet time of it. A night or two later the new tenant dropped in at his club, and noticing a look of surprise on the boys' faces, said:

"No, I haven't been umpiring a ball game I have simply been occupying a friend's furnished house in his absence. He asked as a favor I should do this. Wife and a friend went over with me. The house is a modern one, filled with electricity. You push a button here; you light the gas upstairs, you turn a thingamy here, and open the door. Buz-z-z-z goes a rattlesnake sort of a thing loud enough to scare a tug captain, and wakes the neighborhood. Open one of the windows when the thing is loaded, and off goes a rattle-te-bang hammer on a brass dinner plate big enough for a fire alarm bell.

"Well, for a night or two all was well enough, and wife and I rather enjoyed it. Last night I had to be at the lodge till—eh? Oh! I was, 'pon honor! and I got home a little late. Of course, the keyhole was different from my own, but I found it after a bit. I got in and punched the do-funny and lighted up the gas. Then I turned a what-you-may-call-it, and started up stairs. I forgot about the mat, and, fool-like, I stepped on it. Great Jehosaphat! what an explosion! The burglar alarm went off; the racket I had made at the door started my wife, and she says she ran into my friend's room and waked him, as quickly and quietly as she could. Anyhow, she opened his window and screamed. He fired a chair at me. I ran outside, forgetting about the little crank-handled squeegee thing, and that fired off another racket mill, and just then a patrol wagon drove up, three valiant defenders of the faith and peace grabbed me, and, in reply to some little fool remark I was indiscreet enough to make, made a few quite striking demonstrations with a club, and spoiled my new hat.

"I have seen signs that read, 'Electricity is life,' but I differ with the celebrated savant who originated that dogma. My experience goes to show that it's a darned sight nearer death. Say, boys, I've moved. I'm back at my old home."

During a fire at the Knight & Leonard building, several months ago, a portion of the roof fell, and several brave boys were buried in the ruins. The telephone and telegraph, as well as electric light climbers, were on hand, and vieing, each with the other, in getting their work in first. Among the firemen detailed to assist in digging out the poor fellows who were under the *debris* was Michael McGovern, who, while so engaged, was himself badly injured by a portion of the roof, which was thrown down

upon him in some manner by the wire men. He claims that these men had been ordered away, but stole back, and he sues the Chicago Telephone and the Western Union Telegraph companies for compensation in the amount of $50,000. McGovern is crippled for life.

Prof. J. P Barrett, who is always in advance in practical inventions, left yesterday for Atlanta, Ga., to attend the yearly gathering of the chiefs of the Fire Departments, or more explicitly, the National Association of Fire Engineers, with a paper in his pocket which he will read to the association, and a little model under his arm to show the association. The first will interest the chiefs, because it talks in a very practical way of how to protect persons and property from electric wires, and the model has the same end in view.

The invention is the Professor's own, and it shows the unselfishness of the man, in this, that it is intended solely for places where wires cannot in the natural course of things be placed anywhere but overhead. It is not needed here.

The model shows a ladder, on the one face of which a strip of metal runs the whole length of each standard, or side-piece, and terminates in a metal shoe at the foot of the ladder, on either side. A cross connection is also made from one of these to the other, and attached to the side of the ladder a pair of adjustable wire cutters can be placed at any distance from the bottom.

Of course the use of such a laddder is apparent at sight. It is raised against a wire, the two metallic faces rest upon it. Standing on the ladder, the fireman may cut the wire with impunity, the extra current from the magnets discharging through the cross-connection between the uprights, or, if the line is heavily grounded, the discharge may take place to earth; or it may divide between the two routes.

The regular meeting of the Chicago Club is announced for this evening. A paper is to be read by Mr. E. A. Sperry, and a full meeting is asked, as the matter of permanent quarters is to come before the meeting.

One programme, and this is the favorite one, contemplates the occupation of one double and one single room in the Phœnix building, in the smaller of which an electrical custodian will probably office, and the rooms will thus be open at all times.

Plenty of reading matter, writing materials, burning and eating tobacco, and solid sociability generally will be kept on the table for electrical people. It looks now as if this were all a foregone conclusion. The rooms are far preferable to those at present occupied by the club—although these last are on the first, and the former are on the fourth floor; the present rooms are noisy in the extreme, and poorly arranged. The new rooms are better in every way, and an elevator runs during the entire twenty-four hours, so that whatever may happen, the boys will be able to get out into the street.

It is becoming quite a feat to learn from the electric light people here what they are doing. "Egad!" they say, "we don't want these other fellows to know where we are working. Your letters are constantly giving us away."

"Through my Wichita correspondent" I learn that the efficient manager of the Archer Electric Manufacturing Company (Kansas) has closed contracts with Sterling, Kansas, for a plant of 400 incandescent lamps; with Nickerson, Kas., for the same-sized plant; Peabody, 300; and, in addition, Dr. E A. Hutchins, the aforesaid, will install thirty arc lights at the last named place.

The Archer Company, at Wichita, is constructing a three-story brick building for a central station, and a manufactory. The first floor will have capacity for 2,000 incandescent lamp power, while above stairs anything will be made, from a motor to a call bell.

"From my St. Louis correspondent" I learn that the Ft. Wayne Jenny people have a contract for sixteen lights for the illumination of the city water towers.

The Star Iron Tower Company, of Fort Wayne, have recently issued a circular, announcing, in connection with their mast arm apparatus, the manufacture of the Haskins hanger. The tower people furnish these in various lengths, so that anything desired in the way of length of arm, from six feet to half way across the street, is readily accomplished by the Star Iron Company's masts and the Haskins hanger.

CHICAGO, September 19, 1887.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

"The arc light business is good," said Mr. M. S. Lewis, superintendent of lamps of the Boston Electric Light Company. "For example, I have to day received orders for 150 arcs at the Mechanics' Fair Building for two months during the exhibition, for 40 for the horticultural show, for 15 for Kilrahan's benefit at the baseball grounds, 19th September, for 3 for the baby show at Horticultural Hall; besides I have sold 12 additional commercial lamps. The rage for large regenerative gas burners has gone by. Purchaser will not trade where those cook stoves are over their heads, and storekeepers have found this out.

The Gardiner, Augusta and Hollowell, (Me.) gas syndicate have through Mr. Frank Ridlon ordered Brush apparatus to the three towns mentioned by electricity. The Valley Worsted Mills, Providence, R. I., have ordered a 500 light incandescent Brush-Swan plant, and the towns of Brunswick and Fairfield (Me.) have added to their present plants 450 and 300 lamps respectively.

The street car fitted with accumulators and Sprague motors is expected in Boston next week, when it is to be tested on the Cambridge railroad. The experimental trials at the factory in New York have been successful.

The Ball Electric Light Company, of New England, have recently made the following sales: Boston Steam Power Company, controlling the block bounded by Bedford, Chauncey, Summer and Kingston streets, 35 lights; Park Hill Mills, and Cleghorn Mills, Fitchburg, 30 each; National Worsted Mills, Providence, 90; increase to an order of 95 three years ago. The action of the Boston Steam Power Company is noteworthy as the first attempt at block lighting in New England.

Messrs. Claflin & Kimball, N. E. agents of the Mather Electric Company, 143 Federal street, Boston, have established a central lighting plant in the rear of their office. The station is bounded by Devonshire, Summer, High, Federal, and Franklin streets, and they are lighting several stores, offices, restaurants, etc., etc., and are putting in more lights as fast as possible. They have also taken orders for J. Wayland Kimball's chair factory at West Paris, Maine, and the cotton factory of L. L. Shaw & Co., Yarmouth, Maine, and only recently lighted the factory of the Stoneville Worsted Company at Auburn, Mass.

BOSTON, Sept. 20.

Injunction against Turnbull Granted.

To the Editor of Electrical Review.

At Baltimore, September 16, 1887, Judges Bond and Morris, of the U. S. Circuit Court, upon a bill in equity filed by the American Bell Telephone Company against William C. Turnbull, of Baltimore, and the Turnbull Inter-Ocean Telephone Company, granted the injunction prayed for.

This is the company of which Count Mitkiewicz, of Chinese telephonic and telegraphic fame, was the general manager.

J. M. B.

Washington, D. C., September 18, 1887.

Early Experiments in Cooking by Electricity.

To the Editor of Electrical Review:

Cooking by electricity was first done (so far as the writer knows) by Mr. Thomas Pray, Jr., in Boston in 1881 or 82. He was at that time editor and general manager of the Boston *Journal of Commerce*, and in the office at 64 Federal street, he cooked eggs and beef. Mr. Pray was at that time in some way interested in the "shad pan" (as he used to call it) electric heater. Later in 1882 he sent his heaters as well as the originals back to Richmond to Dr. W. Leigh Burton, and in the fall of '82 Dr. Burton and Pray did cook eggs by boiling, and beefsteak, and the proverbial bacon, in Richmond, Va., at which experiment several other gentlemen were present, and some of the food so cooked was eaten the same evening at Dr. Burton's table. This is written simply as a matter of record.

NORMAN.

Boston, September 20.

OUR KANSAS CITY LETTER.

(From a Special Correspondent of the ELECTRICAL REVIEW.)

F. D. Mills, president of the Atchison (Kan.) Electric Light Company, has gone East to buy a new $50 000 plant for the company's incandescent system.

Mr. C. W. McDaniels, of this city, superintendent of the Missouri and Kansas Telephone Company, has gone to Wichita, Kas., to superintend the putting in of the new cables and the transfer of the exchange from its present quarters to the fourth story of the Feichheimmer block. These cables are covered with lead. Each cable carries one hundred and four wires, and they will run for considerable distances in all directions from the exchange building, doing away with the present network of small wires when the time arrives for the transfer from one building to the other, which will be within a week or two.

Supt McDaniels says that there will be some considerable confusion by crosses which will mix up the voices and messages of their patrons in an amusing, if not an aggravating way. But when that is remedied, which will be within a few days thereafter, all will be smooth sailing and the service will be more satisfactory than ever, and there will be less trouble from the electric light currents, as arresters will be put in. He says that Wichita excels all the towns, and that it is almost impossible to keep up with her growth. For instance, he says they have now on the books one hundred and ten new applications for service and instruments, which cannot be supplied until the cables are put in. There has been nothing like it in the history of the growth of cities in the West.

The Kansas City Electric Light Company has increased its stock to $100,000.

Mr. J. H. Book, of Los Angeles, Cal., has left for the East, to investigate the storage battery scheme of propelling street cars by electricity. He has two lines of railway that he is now interested in, that he wishes to propel, if practicable, by the storage battery principle, and avoid the expense of a third rail, and the dangers that are incident to its use; and also to avoid the use of poles in the streets, to which some persons have objections. Mr. Book will visit all the Eastern cities in which electric railways are in operation, and compare the expense and utility of the same. Should his investigations prove the motor to be the most desirable in use, it does not follow that the present electric means of propulsion are in any degree less valuable. On the contrary, the present poles in use would sell for enough to pay for storage batteries, while the cable is needed in the transmitting of electric power for light or motion, so there would be no loss to the proprietors of the present railways. All the present machinery for the production of electric energy would be needed under the new system, as well as the old, so there would be no loss or disruption by a change.

An electric motor, as yet unnamed, was tested in St. Joseph, Mo., last week. An average speed of eight miles an hour was obtained, and complete success was claimed for the contrivance.

The Oakland, Cal., Gas Light and Heat Company has received a large-sized Thomson-Houston dynamo, to be used in furnishing electricity to light the plazas and streets, in accordance with the recent order of the city council. The company is now planting poles along a number of the streets upon which lights have been ordered, and expect to furnish the twenty lights in about a week. The Pacific Coast Electrical Construction Company have six dynamo machines in operation at the works of the company. About 140 electric lamps are lighted every evening, and twenty additional lights will shortly be placed in position.

The electrical machinery has arrived at the Kansas City exposition, it requiring two cars to bring in the load. Work will be commenced immediately on wiring the building and putting the machinery into place. In the hall 150 arc lights, of 2,000 candle power each, will be placed in position, while outside, around the grounds, 30 of the lights will be used. Add to this the glare of 800 incandescent lights, and the light at Exposition Hall will be brighter by night than nature can make it by day. Lighted up at night, the sight will be a rare one.

An ordinance has been passed by the city council of Independence, Mo., granting to I. W. Rogers, A. W. Jones, W. A. Cunningham, W. L. McCoy, A. M. Ott and W. L. Bryant a franchise for an electric light plant. Work to be commenced in sixty days and completed within six months. The franchise runs for thirty years.

Mr. Warren Watson, Secretary of the Kansas City Electric Railway Company, which uses the Henry system, says: The Henry system of electric railroads is meeting with the approval of all interested in the question of running cars by electricity At San Diego the system in use on the Kansas City Fifth street line is adopted with but few modifications. The trial trip on the San Diego road was recently made and was very satisfactory.

Some time ago Mr. Guernsey, of the Guernsey-Jones Furniture Company, and also the agent for Sprague's system of electric motive power, contracted for the laying of a track and hanging of wires on the Laclede extension of the Missiouri Street Railway, in St. Louis, for the purpose of giving a thorough test to the system of hanging wires. When all arrangements had been completed for pushing through the project, Mr. Sprague, the inventor, was taken seriously ill. He is now convalescent, and on his arrival in St. Louis in a few days the work will be pushed through as soon as possible.

G. M.

KANSAS CITY, Mo. Sept. 16.

The Telephone and Tommy.

"Hello, central," calls Mr. Smith, "please connect me with Mr. Jones."

"Go ahead," said the girl's soft voice, and at the same instant Mr. Smith hears a child's voice screaming at its very tip-top, "Tom, Tom, the piper's son," in his ear.

"Good gracious!" said he. "Hello, Mr. Jones."

"Hello, hello, who's there?" comes from a gruff voice.

"Tom, Tom, the piper's son—"

"Do shut up there, will you? Hello, hello, Mr. Jones."

"Oo—oo—oo—" comes a confused blur.

"Hello, Jones! where are you?"

"And away he run—" screams the high, shrill voice.

"—— —— —— !!" said Mr. Smith.

Of course Mr. Jones hears him this time.

"Hello, Smith," he calls, "what's all the racket?"

"Oh, that confounded child," he groans. "Say, Jones, how did you get along yesterday, what did you do?"

"He stole a pig and away he run!"

"M—m—m," from Mr. Jones.

"Look here, young one, if you don't stop that noise I'll wring your neck. What's that, Jones?"

"Tom, Tom, the piper's son, stole a pig and away he run—n—n."

"Hello, Smith!"

"Hello, Jones!"

"Tommy, Tommy, the piper's so—o—ny"—

As the operator plugs in to find out if they are through with the wire, she hears two receivers flung fiercely on their hooks and the shrill voice still singing:

"Stole a pig and away he runny—y—y—"

The next mail brings two letters from Mr. Smith and Mr. Jones respectively, stating that if they cannot have better satisfaction in using their telephones hereafter the telephone company may as well remove them.

SPUR.

FABLE.

A hungry Volt was out for a meal one morning, and in a lonely spot he encountered a solitary Ohm, and "went through him like a shot." He only got a single Ampere for his pains, and lost his own life in the struggle.

MORAL: Before you treat your girl to ice cream make sure of the E M.F., and avoid the "volting ambition which o'erleaps itself."

Telephonic News

*** Over 100 telephones have been burned out in Bridgeport, Conn., during the recent thunder storms.

*** Construction work on the long-distance telephone line between New York and Boston is being pushed rapidly. A number of gangs of men are at work at different points. It is likely that a direct line from Albany will also be constructed, connecting with the Boston line at Springfield, Mass.

*** The use of the telephone in Berlin is rapidly extending. At the beginning of last month the number of subscribers was 6,262, and there were seven exchanges in the town and twenty-one in the neighborhood. The postal authorities have some difficulty in keeping pace with the public requirements as regards the telephone service. At the present moment there are 1,000 applications lodged at the office, and new applications are coming in at the rate of 150 per month. The total number of separate circuits is about 10,000, of which 8,000 are above ground. The placing of wires underground is being opposed by the Town Council, who object to the frequent disturbance of the pavement, and are endeavoring to levy from the post office a tax for the use of the streets in the same way as they levy a tax from electric lighting companies who use the streets. Generally the town authorities raise no objection to overhead wires, and are even disposed to consider them as an element of safety. It has been observed that during recent thunderstorms those portions of the town which are most thickly covered with telephone wires enjoyed complete immunity from strokes of lightning, whereas damage was done in other districts. The explanation of this fact is that a large number of the posts supporting telephone and telegraphs wires have purposely been connected with earth, and these posts form, together with the net work of wires, a fairly efficient protective system.

*** I heard a story, writes a Washington correspondent, about the manner in which the telephone invention was originally offered around New York, without finding any one to take it or furnish capital to promote it. Certain gentlemen secured an option on the telephone at one time, the terms of which would have given them its use in the entire United States for a royalty of not over $30,000 a year. Their part of the agreement was that they should establish exchanges in the leading cities, and pay $2 royalty a year on each transmitter used; but in no event were they to pay over $30,000 a year. They were unable to raise the necessary money to start even one exchange before their option expired. Mayor Hewitt had an opportunity, it is said, to get the biggest end of the telephone for $20,000; and a controlling interest at about the same time was offered to the Western Union Telegraph Company for $11,000. Ex-Governor A. B. Cornell was acting president of the Western Union Company at that time, Mr. Orton being abroad. When the use of the telephone was explained to Governor Cornell, he said: "The machine is all right; but what do men want to talk about?" Then he went on to argue that men would not be inclined to commit their secrets over a wire, where other people might hear them. Then he indicated that they would prefer to use written messages and inclose them in an envelope, where nobody could see them, and have them sent without danger of others knowing anything about them. Senator Don Cameron has denied the report that he was offered a fourth interest in the telephone for $50,000; but it was understood, nevertheless, that he was offered a big interest for a small sum of money, and refused it. The figures may not be right; but the general fact has at least passed into current public belief.

How to Obviate the Danger Emanating from Overhead Electric Wires.

BY PROF. J. P. BARRETT, SUPT. FIRE ALARM TELEGRAPH, CHICAGO.

(Read before the National Association of Fire Engineers, at the 15th Annual Convention, Atlanta, Ga., Sept. 21, 1887.)

GENTLEMEN: It was my pleasure to appear before you at the last meeting of this association, and present my views on the dangers arising from electric light wires and the underground system.

What I shall offer on the present occasion must to a certain extent savor somewhat of repetition, but we must not forget that it is the long-continued droppings that wear away stone.

Within the year past there has been permanent as well as rapid advancement in the right direction in the handling of electric light and other wires. This change has resulted, as I believe, from two causes.

The insurance people, hand in hand with their best friends, the firemen, have made it uncomfortably warm for the electric light people, and set them thinking out some cause for this higher temperature, and seeking some method of extinguishing the blaze. Then too, every twelve months there is a balancing of books and a rendering of accounts, which has been showing that thousands of dollars have been thrown away by economizing in construction—a good illustration of saving at the spigot, and wasting at the bung.

The electric light people, like the hotel keepers, are not doing business for their health, and when the capitalist looks over his balance sheet at the end of the year, and finds that he has made no money, it is but natural that he should ask why this is so? The answer is too often found in the cheap methods of construction, under a false idea of economy, which the company has been induced to adopt.

In the earlier days of this business, cheap installations were the rule, while to-day, though perhaps not the exception, the average is several degrees better.

Better or worse construction means less or more danger from electricity. Safety is true economy. This much the electric light people will acknowledge to-day, while (at least by action, which sometimes speaks louder than words) a couple of years ago they flatly denied it.

In February last, a paper entitled "For High Insulation" was read by Mr. C. C. Haskins, before the National Electric Light Association at Philadelphia, which it was more than half expected would not be well received; yet the result of that paper, which was generously applauded, was to materially advance the cause of protection for both life and property.

In that paper reference was made to the underwriter wire, which has hitherto been used very largely for all sorts and kinds of outside and inside installations.

This wire is probably one of the most mischief-making elements in the business. The insurance people at the outset demanded a wire with fire-proof insulation. That was some years ago. The wire was produced, and consisted of an insulation made of cotton braid, painted with white lead. A covering of that nature was of course far from inflammable, and when dry was an insulator. It was accepted, and the sharp individual who manufactured the article, saw the advantage which would arise from a proper christening, and so he called it underwriter's wire. The name has sold hundreds of tons, and those tons have cost heaven only knows how many dollars per pound, in fire losses.

I am the more elaborate on this question of painted wire, because in every city that is represented here, that abomination is carrying electric currents to-day.

You all know what is meant by an insulator or an insulating substance. It is any substance or material which refuses more or less perfectly to carry an electric current, and a conductor is precisely the reverse of this.

Then there is a class of substances which under some circumstances refuse to carry electric current, while under others they will carry the current as readily almost as the wire itself.

One of these substances is cotton—raw, spun or woven. When dry it is a good, sufficient insulator. It is quite difficult to force it to convey electricity. So of nearly all fibers—wool, silk, hair. Now, if we wet it—merely dampen it—it becomes a conductor. The wetting has done this. The water, in reality, is the conductor, but the cotton, string, or cloth, or braid—it is all the same—holds the water, and the conductor is there.

Now this so-called underwriter's (sometimes called undertaker's wire, for variety) is, as I have said, cotton-covered—braided—and soaked with white paint. It is not water-proof, and when dampened will carry electricity of even very low pressure, without difficulty.

Here is an experiment made by I. N Miller, of Cincinnati, O. He says: "Careful experiments made by immersing 12 inches of this wire in a 6"x8" jar filled with water, the ends extending above the jar so that the water would come in contact with the covering only, shows the following insulating properties:

After one minutes' time, the resistance was 115,000 ohms.

After three minutes, 4,170 ohms.

After five minutes, 1,770 ohms.

After one hour, 280 ohms.

One hundred cells were used in making the test, one pole of the battery being connected with the water in the jar, the other pole with the copper conductor."

An ohm is a measure of resistance of obstruction, the same as a pound may be applied to measure friction resistance. It is something to be overcome by current. What Miller was doing, was showing how much resistance to the passage of a current of one hundred volts (the output of one hundred cells of battery) there was in that underwriter's insulation. He reduced it from 115,000 units to 280 units, with one hour's soaking.

But this one hundred volts of pressure is only the equivalent of two arc lamps, for arc lamps require fifty volts of pressure per lamp, as a rule. Suppose then this wire had been tested with, say a 60-lamp current, or 3,000 volts, instead of one hundred, what would have been the result? So much for underwriter's wire. I have spoken of it as white wire. Its reputation has so far deteriorated that the manufacturers have put some of it on the market colored black. Look sharp for it. White or black, wherever it comes in contact with moisture it becomes a wolf.

For inside purposes, above the level of cellar moisture, where there is neither leak nor steam, the underwriter's wire will do good service on proper insulation, but it will bear watching.

The dangers from such electric wires, where these are run in a go-as-you-please sort of way, over houses, on poles, fences, pretty much every place where they should not be, as these are quite often placed, cannot be overestimated, or too thoroughly corrected. They are a constant menace to life and to property. They are liable at any time to become crossed or grounded on wires, one, if not both ends of which, run to ground. The grounded end of the line may be a mile or more away, in a dwelling. It may be in a mill that is not running at night, and it may not be anywhere to endanger property. Simply because the fates have bestowed a favorable condition of affairs for years, that is no guarantee for the future. Prevention is always better than cure—it costs less, and leaves the constitution in a better condition.

Right in this line of thought, and in this connection, let me give you a few facts, by way of holding this matter down on a solid foundation.

Early in the year I took pains to address a circular, asking a particular class of information from the authorities in most of our principal cities. I wanted to know, direct from those who knew, something about the fire and personal dangers of electricity.

In several instances no answer was received, and the statistics are therefore incomplete. The tabulated aggregate of what I did receive shows that there have been

137 fires, with a total loss of $1,165,336.

7 accidents.

40 deaths.

Far be it from me to set up my voice against so popular and so necessary an element of industry as the power we derive from the dynamo. It would be foolish, even were I capable of stemming the tide. It has come to stay. It is capable of subjection and training; and this is being done by the inventors and constructors of machines, and those who are making its applications for lighting, for power, a study. Its danger lies in the careless handling of a force which, like other great agents of usefulness, may be as potent for evil as for good, in bad hands, or badly handled.

How to curb and bridle this force is what we are endeavoring to find out. We want some reasonable, thorough method of warding off threatening dangers, and, at the same time, of correcting faults which have existed until they may have become gray-headed. I am one of those who do not believe that gray hairs are to be honored simply because they are gray. Age is not always to be respected simply because it is here. So I say, let us endeavor to do away with anything gray in this wire business which has nothing on which to base its claim to respect, save its tottering steps and its silvered head.

You ask, How will you do this? How are we to accomplish the result desired, and make our electric light people take such precautions as shall insure our lives, and the property we have the care of, safe from the dangers which beset us from these poor installations? I answer in one word: Insulate them. Place them, electrically and mechanically, where they can do no harm. How to arrive at that result must depend upon local legislation. Join hands with the insurance interests, appeal to the law makers, to your aldermen, your councilmen, your selectmen, your commissioners—whatever the law-making body may be. You will find plenty of encouragement from the property owners, who depend on you in cold weather emergencies—men who have property to lose; these will aid you in obtaining the proper law to restrain the lawless methods heretofore practiced. It is quite the fashion everywhere to do this, and you will not find yourselves out of style.

What you shall demand in your ordinance or regulation should be well considered and digested, before presentation. There is nothing like having such an act far-reaching and thorough; and it is not at all comforting to feel, after an act has been passed, that an essential point has been omitted.

There are more towns and cities in the Union which will adopt, as Chicago and some others have already adopted, a general underground system, and compel all wires to go into this. Some are now in the agony of that sort of birth, some are not yet up to the scratch; but a good many will get there in the end.

There will be a majority of these towns which will own and control the underground system they adopt, and I think they will do well.

We hear every day from somebody, away off down in some swamp or back alley, shouting at the top of his voice, "Underground is a failure; it don't work!" and yet all the time it is working in Chicago; and in our conduits we have as many varieties of wires as there are above ground in any two cities in the Union—as many kinds, understand. We have everything, from a cable less than an inch in diameter, with fifty wires in it, up to a cable as big as your thumb, and only one wire in it; we have telegraph and fire alarm, and telephone and call bells, watch service, mercurial and burglar alarms, and police and—well, if you can think of anything else, call the turn; we've got it in our conduits, and they all work, and work far more satisfactorily than the overhead undertaker lines. Don't let the croakers rule you off the track.

I would say, then, put them underground, if that can be accomplished and pull down every wire which is overhead.

Many of you cannot accomplish that desirable end. As a second choice, then, I would say put them under control of an electrician, if possible, who will, under proper authority from the heads of government, kindly but earnestly enforce such changes in bad installations, and compel such methods in new ones as should render the work reasonably safe.

The parties who do this inferior sort of work are not wholly to blame for what seems to be willful or careless. They do not know. Take an example which recently fell under my eye near Chicago. An outdoor installation was being constructed, where a part of the wires were run on the joists underneath an uncovered platform. The wire was of the description above alluded to—underwriter's. The floor was dry, the joists ditto, and the wire run without insulators. Before the work was fairly finished a heavy shower came up, and the whole plant was so thoroughly wetted that it had to be pretty much all done over before it was fit to run Now if the constructor had been permitted to finish and get out of the way before that shower came he would always have thought he had done an excellent piece of work. As it was he said he had no idea of rain ever getting under those planks, although they were hardly close enough together to play marbles on.

If in the third place, it is neither possible to control the wires by burying or inspection there remains but one course to be pursued, which is to have such restrictions thrown about the placing of plants as shall compel:

1. A class of wire to be used which is not affected by water.
2. That the lines shall be placed upon insulators everywhere, in passing along buildings, and run clear of rods, awnings, etc.
3. If on poles, these to be sufficiently high to prove no obstruction.
4. In crossing buildings, to be at least seven feet above the roof.
5. That lamps in front of a building, over the sidewalk, shall be fixed and trimmed from a step-ladder, or placed upon some form of crane which takes the strain from the suspension rope.
6. That no joint shall be made in the wire where it can reasonably well be avoided; all joints shall be soldered and taped with insulating tape.
7. That at all points where abrasion is possible, or where passing through partitions or into buildings, particular care shall be taken to preserve the insulation intact.

But even then there should be some method of testing the lines for insulation, though that is in the line of an inspector's duty, and some instruction is necessary to accomplish this. It can be done, however, and there should be a test of this nature provided for in the controlling act.

In the matter of incandescent or glow lamps there is less of danger to person, but there are forms of this which are attached to and made part of an arc circuit, and actually make this worse than a simple arc line, because the majority of that sort of combinations are liable to do some unexpected thing, and it is always the unexpected which happens.

An incandescent circuit, pure and simple, owes its safety largely to the introduction of fusible strips at the various branchings of the wire, and there should never, where possible to avoid it, be more than six of these lights to one of these safety devices.

We are constantly reminded by the curious and apparently lawless action of electrical force that it is the possibilities, and not the probabilities of the case, which we must guard against and prevent. No two consecutive cases are precisely alike, and no law can possibly stipulate all the points to be watched in every possible case. Some judgment, some discretion must be left to the inspector, examiner or expert, and he should be able to clearly and fully explain why he demands this or that in one case which he has not required in another; and when he has made the demand or given an order there should be no lack of authority at his back, and no interference with him on account of friendship or favoritism. If the man is capable, stand by him—if he is not, let him go—and find one who is.

I have briefly outlined a few thoughts on this subject which would bear elaboration far beyond the time you would place at my disposal. I shall be happy to give you—any who may desire—any information which practice and experience may have placed at my disposal, and trust that I may possibly have dropped a hint or two to aid in the good work of protection from danger, while encouraging the proper advance of electricity as an illuminant.

Improvements in the Cowles Electric Furnace.

The descriptions published in connection with the Cowles electric furnace, which has been so successfully used for the production of aluminum and alloys of that metal, have induced inventors to turn their attention to that method of obtaining the valuable and useful metal. Dr. E. C. K. Fiertz, of Zurich, has, for instance, obtained two patents in England, in one of which the improvements consist in fusing and decomposing aluminum and other light metal compounds in an aluminous-lined or other vessel, by the direct action of the electric current, and without the aid of external heat; in the other they consist mainly in treating cryolite or other metal-bearing substances by the action of an electric current in a vessel provided with a suitable lining cathode, the anode being formed in the shape of a cylinder or in segments, and so placed in the vessel as to be practically excluded from contact with air.

Fig. 1 in the drawing shows a furnace embodying this invention in vertical section through the center, with the automatic feed-regulating apparatus attached thereto. Fig. 2 is a side view of the automatic feed mechanism. By means of this invention the regularity and uniformity of feeding or charging the furnace is effectually accomplished. It is important for many reasons, prominent among which may be mentioned: The fluctuations of the current are governed and controlled within definite limits; the draft upon the motive power is made more constant and uniform, and the dynamo is relieved from the risks attendant upon sudden or undue variations in the resistance of the external or working circuit. In Fig. 1, *A* is the positive electrode, preferably made of electric-light carbon, in the form of a pipe or hollow cylinder. *B* is the feed hopper, preferably made conical in form, and having its lower end attached to the top of the positive electrode. *C* is the negative electrode, also made of electric-light carbon, in the form of a hollow cylinder, and fastenend to the plate *D*, which is built into the lower portion of the furnace, and to which plate the negative wire of the circuit is connected. *E* is the furnace walls, formed of firebrick, silica, lime or other refractory material. *F* is a lining or filling of fine charcoal, pulverized lime and carbon, or other suitable material; this lining surrounds the negative electrode *C*, and insulates it, and being a bad conductor of heat as well as of electricity, it prevents the destruction of the lower part of the walls and the bottom of the furnace, when the furnace is in operation. *G* is also a lining of charcoal, lime and carbon, or other suitable material; this lining surrounds the zone of fusion between the positive and negative electrodes, and extends upwards around the positive electrode. This lining *G* is similar in function and character to the lining *F*, but is made of coarser material, to provide for the escape of the gases given off from the charge at the zone of fusion when heated by the current, and is in contact with the terminals of the electric circuit. *T* is an escape pipe through which the fumes and gases pass from the upper part of the furnace into the condenser *t*. The lever *I* is attached to the feed hopper *B*, and by means of the screw *J* the hopper, together with the positive electrode *A* attached to it, may be raised or lowered to increase or decrease the width of the zone of fusion as required, or to compensate for the wear of the electrodes. *K* is a poker or plunger of carbon, placed within the hopper *B*, and extending downwards through the electrode *A* nearly as far as the zone of fusion; this poker is provided with projections *k* for better acting upon the charge, and is attached at its upper end to the crank of the driving shaft *L*, by means of the connecting rod k^1. The driving shaft *L* is supported in any suitable bearings, and is provided with a gear wheel, which engages with a similar gear wheel *m* of a motor. *N* (Fig. 2) is a brake lever pivoted at one end in the support *n*, and supported at the other end by means of the spring *O*, and screw, which latter passes through a screw-threaded hole in any suitable fixed support; by means of the screw the tension of the spring *O* can be regulated. The brake lever *N* is provided with a projection, which engages with the serrations of the brake wheel m^1, when the brake lever is in its raised position and locks the motor. *P* is an electro-magnet placed beneath the outer end of the brake lever. *R* and *S* are the circuit wires attached respectively to the positive and negative electrodes and the magnet *P* placed within the circuit. The essential feature of this furnace is that the resistance is regulated and preserved constant by the movement of the charge itself, and not by the movement of the electrodes as at present practiced; the action of the furnace is rendered continuous for a long period, and the time lost in charging and emptying the furnace as hitherto constructed is saved. The electrodes act as conductors only for conveying the current to the charge, and the heat is generated in the charge itself by its electrical resistance, the carbon constituents of the charge becoming incandescent.

The practical operation of the furnace is as follows: The feed hopper is filled with the material to be reduced, and the current is passed through the wires; this causes an intense heat at the zone of fusion between the electrodes; the material is there reduced, and falls through the lower electrode into the lower part of the furnace. The electro-magnet *P* is made of just such a power that when the resistance at the zone of fusion becomes less and more than the normal amount of current flows through the magnet, the end of the brake lever will be drawn down against the tension of the spring which supports it. This movement of the brake lever sets free the brake wheel, and the motor shaft is free to turn, and by means of the driving shaft and crank to operate the poker in the furnace. The movement of the poker up and down forces more of the charge in the hopper to descend into the zone of fusion, and when the resistance is thereby increased to the normal amount, the current, which is proportionately decreased, allows the electro-magnet to let go the brake lever, which then stops the movement of the poker.

FIG. I

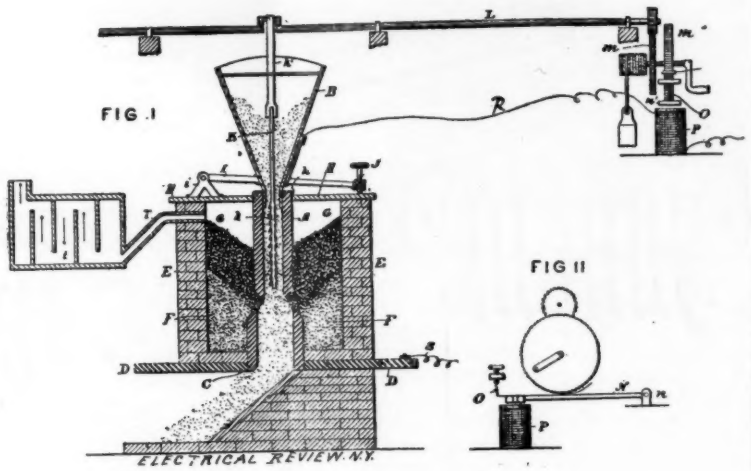


FIG II

ILLUSTRATION OF IMPROVEMENTS IN COWLES ELECTRIC FURNACE.

TELEGRAPHIC

.... The Orange (N. J.) city authorities are at work at and have almost finished setting the few additional poles required for the fire alarm system, the poles of the New York and New Jersey Telephone Company being utilized as far as possible for that purpose. The alarm boxes, gongs and other material are on the ground, and the Gamewell Company has commenced active work in putting up the system. This work will not take longer than two weeks.

... About two years ago the Erie telephone connection between Minneapolis and St. Cloud was discontinued on account of inefficiency. Mr. C. P. Weinman, general agent of the company, has been in the city recently, and perfected arrangements to again put the line in working order, whereby St. Cloud will be enabled to have direct connections with Minneapolis and St. Paul. The company will establish an exchange at St. Cloud if the arrangements and the working of the lines are satisfactory.

About Lightning.

A correspondent writes: There is an opinion prevalent among the public that lightning does not strike twice in the same place; this, however, is a fallacy, as it is well-known to those who study electrical phenomena that lightning does strike in the same place more than once, and that it will fall upon a certain place just as often as the natural conditions are such as to determine the lightning discharge to that point, or just as often as that place lies within and forms the path of least resistance.

Probably one of the best illustrations of numerous lightning discharges falling upon one place that has ever been recorded in the United States is upon the farm of Mr. W. F. French, who lives near Flushing, Genesee county, Mich. Mr. French is an industrious farmer, and from the numerous lightning visitations he has had, he might well ask when and where will it end. In the summer of 1871 his barn was struck, doing but slight damage to the barn, but killing a fine team of horses, worth $400, which were in the barn at the time. In 1878 the same barn was again struck in exactly the same place and another fine team, that he had refused $400 for, were killed while standing in the identical stalls occupied by the team that was killed in 1871. In 1884 a fine Clydesdale stallion, valued at $1,000, was struck and killed, and during the present summer he lost another valuable horse, valued at $200, which was struck while grazing in a field. At various times between the above disastrous strokes a great many trees were shattered, and it is a frequent occurrence for lightning to strike the earth in an open field, often tearing a hole in the ground. The great frequency with which lightning strikes upon this farm suggests forcibly that there must be some natural cause for it. The land is rolling, and a small stream meanders through one part of it. The soil varies, and there are several kinds of trees on the place, such as beech, maple, oak, basswood and ash. Mr. French states that he has found what he supposes to be an iron ore, but that he has never investigated the matter to learn the extent of the body of ore or ascertain its nature. He believes that there must be something on his farm that attracts the frequent discharges. If it is a fact that the ore he has found is an iron ore, and if it crops out at the earth's surface, that alone would in a measure account for the frequent lightning strokes, while it may be that there are other natural conditions surrounding this farm that facilitate and invite the electric force.

I could cite many cases where lightning has struck several times. No doubt many citizens remember the terrible accident at the Atlantic Flour Mills, in St. Louis, on August 12, 1881. On the same day just five years later, the new mill, now called the Regina Mill, was struck but the conductors saved the building. The charge was a heavy one, as it wrenched the conductor leading to the earth on the north side loose. In St. Louis lightning falls more frequently in the vicinity of Main and Plum and in the neighborhood of the Belcher Sugar Refinery than in any other portion of the city. I have noted this fact for the past seven years, and have records of many discharges in those districts, which happily did but slight damage.

ELECTRICAL AND SCIENTIFIC

Waterhouse Standard Ammeter.

Most of the best electrical measuring instruments in use depend for their action upon a permanent magnet or in their construction a coiled spring is used, so that the magnetism of the magnet or the resiliency of the spring is a varying quantity, and frequent calibration is necessary to correct these variations. The object in producing the Waterhouse Standard Ammeter was to build an instrument with the action always the same, so that when once standardized its reliability would be lasting.

The instrument is most sensitive to the variations in the current transmitted through it, and is not only adapted for use in electric light stations, but also for laboratory tests.

Fig. 1 shows the ammeter as finished. A voltmeter is also made on same principle, and an ammeter and voltmeter combined.

On the top are the binding posts for circuit wires, and also a small compass for denoting the direction of the current. The front presents a dial with silver indicator, and on the floor is a table on which the calibration of the instrument is recorded. These are enclosed by a glass that is secured in position by a screw and washer on top.

Fig. 2 shows a section of the working parts, consisting of a coiled conductor wound around a stationary soft iron core—*M*, said core having a longitudinal slot, situated to the left of the median line of the upper edge of the periphery of the core. In this slot is placed a soft iron armature—*A*, which is provided with iron pendant pole pieces and a silver pointer. The armature *A* and its pole pieces and pointer are all one piece and are finely pivoted at each end and free to swing or vibrate, while the core *M* is stationary.

The current in the coiled conductor polarizes each end of *M* and *A* alike, so that the poles attached to *A* are of the same sign as the same ends of *M*. The result is, that like poles repel, which causes the pendant parts of *A* to swing away from the center of core *M*, as shown in Fig. 3, carrying the pointer, as shown in dotted lines, to an angle corresponding to the intensity of the current passing through the conductor to be measured. Use is made of the repelling power of magnetism, for the reason that it is prolonged and exerted evenly, while that of attraction would be variable. When the current is cut off gravitation carries the pointer back to *O*.

The use of the repelling power of magnetism and gravitation for returning the indicator to *O* overcomes the necessity for a permanent magnet or a coiled spring.

These instruments are made by the Waterhouse Electric & M'f'g Co., Hartford, Conn.

Attracted by the Electric Light.

"Somebody sent a letter a few days ago asking if the electric lights gave out a bad odor," said Manager Redman, of the Brush company, at Troy, N. Y. "The lamps are the cause of a bad odor at this time of the year, but it does not come from the electric fluid nor from the burning of the carbons. The explanation is very simple and would be manifest to the correspondent if he had ever been present at the cleaning of a lamp after a warm night. The light attracts innumerable insects that kill themselves in contact with the lamp and collect there by the pintful. The mass of decaying animal matter gives out the offensive odor the correspondent complained of. I do not wonder at his complaint, for the stench is particularly offensive. In certain situations we are obliged to protect the lamps with wire gauze to prevent the winged creatures from flying against them and interfering with the light. Ever since the introduction of electric lights the workmen at the various works have been surprised at the strange and varied visitants that come into the rooms at night. Our works at the lower falls are particularly well situated to attract all sorts of creatures that fly by night, and we have a very miscellaneous collection pinned on the walls, after the fashion of regular entomologists. The boys have had some monster moths come in at night, and all the specimens were duly pinned to the wall. It might interest a collector to call and examine our cabinet. Most of those we have seem to fly altogether by night, for they are of a kind that I never see by day. In former years we frequently caught a large green butterfly, but I have not seen one of them this year. Perhaps their season for skirmishing by night does not arrive until later in the year. By the way, the men at the works occasionally assume the functions of experimental philosophers, and try electrical experiments on various living creatures, including man. Cats, dogs and snakes are favorite subjects for experiments, and the dog or cat that has once ventured into an electric-light works without a friend to protect him from experimentalists is likely to go away with such a lively recollection of his experience that he will never call again. Dogs or cats that are given a shock seem to regard it as something unnatural and diabolical—that is, if they have an idea of such things. They exhibit symptoms of fear that are not manifested when they are hurt by ordinary means. We caught some snakes in the rocks near the works and found that a slight shock was enough to kill them. Great and small ones never made a movement after receiving a current."

FIG. 1.

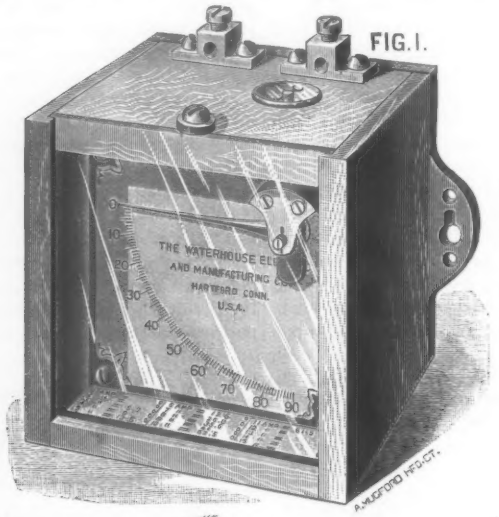


FIG. 2.

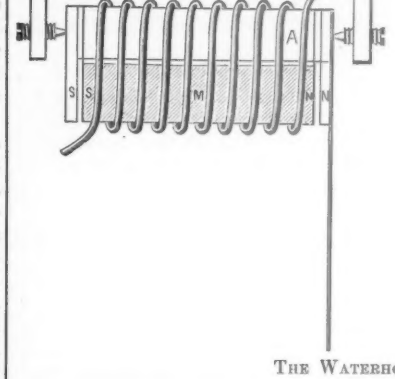
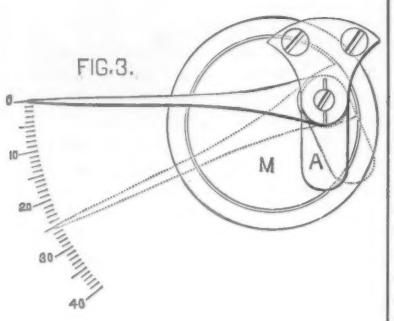


FIG. 3.



THE WATERHOUSE AMMETER.

The Telephone in China.

A dispatch from Baltimore says: "The American Bell Telephone Company made a move in the United States Circuit Court here to-day to head off Count Mitkiewicz, and nip his Chinese telephone scheme in the bud. The system that Mitkiewicz wishes to introduce into China is the one invented by Wm. C. Turnbull, of this city. Just now there is trouble between Mr. Turnbull and Mitkiewicz, on the complaint of the former that the latter has used his patent without authority. Now the Bell Telephone Company steps in and tries to stop Mitkiewicz by restraining Turnbull. In the United States Circuit Court to-day Judges Bond and Morris, upon a bill in equity filed by the Bell Company against Mr. Turnbull, signed an order providing that until the hearing of the motion the defendant be restrained from directly or indirectly making, using or furnishing to others for use any electric speaking telephone or telephonic apparatus whatever embracing and embodying the inventions and improvements, or any material parts thereof, claimed in the letters patent of the complainant corporation granted to Alexander Graham Bell. The 1st of November is fixed for the hearing, at which time the defendant is ordered to show cause why an injunction *pendente lite* should not issue against him."

*** Mr. Ellis Lever has renewed his prize of 10,000 marks for an electrical safety lamp.

*** The offices of the West Coast Telephone Company have been removed from 44 Broadway to the new telephone building at 18 Cortlandt street. This building is the great telephone headquarters of the city.

A Table of Electrical Units.

Subject.	Symbol.	Name.	Values of Units. C. G. S.	M. G. S.	Practical.
Electromotive force.	E	Volt	10^8	10^5	Daniell, .9628.
Resistance	R	Ohm.....	10^9	10^7	Siemens 1.026.
Current.....	C	Ampere.....	10^1	10^2	Hydrogen equivalent, gramme .00001022
Quantity	Q	Coulomb....	10^1	10^2	Mascart gives gramme .000010415.
Capacity	K	Farad.....	10^9	10^7	
Capacity, practical .	..	Micro-farad.	10^{15}	10^{13}	3-5 miles of average cable.
Energy.....	J	Joulad.....	10^7	10^3	107 ergs.
" as work.....	W	Joulad.....	10^7	10^3	Ft. lb., .7373.
" as heat.	H	Joulad.....	10^7	10^3	Calory, .2381.
Power.....	..	Watt.....	10^7	10^3	Horse power, 11,134.
Power.....	..	Volt-ampere	10^7	10^3	44.24 ft. lbs. per min.
Electrolytic current.	..	Chemic.....	..	..	1 grain hydrogen in 10 hours.
Electrolytic energy..	..	Equivolt....	..	..	4,673 ft. lbs.

Reckenzaun's Secondary Battery.

In the *Review* for April 22 we briefly described a form of secondary battery devised and patented by Dr. Frankland, F.R.S., and it will not escape notice that the invention of Mr. Reckenzaun is to all intents and purposes identical with the foregoing, the latter patentee, however, having the good fortune to antedate Dr. Frankland by a very short period of time only. Before entering into the details of Mr. Reckenzaun's battery it may not be amiss to dilate, although somewhat briefly, upon storage cells generally.

Among the numerous systems of secondary batteries, those of the Electrical Power Storage Company have been regarded as the most successful in the commercial sense, as well as in their constructive arrangements.

This company owns the patents of Faure, Sellon, Volckmar, Swan, and others, the first being acquired for the purpose of obtaining the use of his invention for the application of red lead or other oxides, which he pasted upon or into metallic lead supports. All the other patents held by the company control the use of perforated, indented, corrugated, or reticulated metal supports or plates, the hollow parts of which are filled with the paste devised by M. Faure.

The Electrical Power Storage Company and their host of imitators, amongst whom may be reckoned Julien, Epstein, Farbaky, and others, make or cast grids with square holes, somewhat conical internally, for the better retention of the oxide which is subsequently pasted into them. It is well-known that this paste expands, when converted into peroxide, through the electrolytic action in the cells when charging. This expansion takes place in each square, and consequently all over the plate, but, unfortunately, as the natural result of the varying mechanical resistance offered by the support, not evenly. Thus the paste in the center of a square plate will have a considerable resistance to overcome by virtue of all the surrounding substance, whereas those parts nearer the edges encounter less opposition and expand more freely; hence the plate must become distorted—a state generally termed "buckling." Two neighboring plates, if they do not buckle in the same direction, will thus come into actual contact, and in the endeavor to avoid this the manufacturers place india-rubber plugs into the plates at short distances apart, so as to render the free unsupported surfaces as small as possible. These precautions, however, do not remove the tendency to unequal expansion; they merely offer a rude remedy which cannot remove the cause. Moreover, it occurs very frequently that the lead frames burst after prolonged use, this being another result of unequal expansion.

But a worse evil than this is found in the fact that the paste detaches itself from the conical support and drops out in halves or in smaller fractions.

This invariably occurs after a time even in the stationary cells, and such a fault renders perforated plates practically useless for purposes of locomotion. When shaken in a tram-car, for instance, the detachment of the paste is promoted to a large extent, so that the plates become unserviceable in the course of a few months, or even weeks.

The life or depreciation of secondary batteries of the systems indicated depends, first, upon the time necessary to cause the bursting of the grids through buckling, or the tendency to buckle, and, secondly, upon the period of retention of the paste in the holes. Under the best conditions, we do not think we shall be in error if we say that the life of such plates does not usually exceed two years if worked to their full capacity, and this means an expense which but few electric light installations can bear, and, so far as tram-cars worked by accumulators of this description are concerned, there is little hope for success from a commercial point of view.

It may be mentioned that the india-rubber plugs form a very expensive item in the cost of secondary battery manufacture, both on account of the price of the material and the labor involved in fitting the plugs into the plates Furthermore, the use of red lead as generally adopted renders the "forming"

process at once troublesome, complicated, and costly.

We will now proceed to describe the improvements effected by Mr. Reckenzaun with the view of overcoming the disadvantages which we have enumerated, the sketch shown being taken from an actual plate in our possession. The inventor prepares small cylinders of spongy or finely divided lead or other suitable porous material, and places them at short distances from each other and in regular lines upon the lower half of an indented metal die. The two halves being fitted together, molten metal, preferably lead or a suitable alloy thereof, is poured in, thus forming a resultant conglomerate plate of great strength structurally, and from which the paste cannot by any chance become disengaged. The advantages claimed for this method of construction over other types of cells are as follows:

1. Freedom from buckling, since any possible expansion can only take place in the direction of length.

2. No possibility of the active material becoming detached.

3. No india-rubber plugs or other costly separators; sticks or rings of any insulating substance suffice to keep the plates the requisite distance apart.

4. No double process of formation is required, the positive plates being exactly similar and of the same material as the negatives. When the plates are connected up the cells are ready for immediate use.

5 No pasting in the ordinary sense is necessary; the porous cylinders are made by machinery and are consequently cheap.

6. The durabilty and certainty of action is vastly increased.

7. Whilst the cost of manufacture is considerably less, the depreciation is correspondingly smaller.

8. Large working capacity with small amount of material and little space—a 200 amp. hour cell measures 7½ inches × 7 inches ×10 inches high.

9. Can be discharged at any rate without materially affecting the plates.

The following comparison, showing the saving of material and labor, taking the E.P.S. cells as a basis, is given as an example: The doing away with india-rubber plugs, and substituting sticks or rings, will give a saving of 6 per cent. in the prime cost. The plates of the E.P S. Company have to be "formed" separately in forming boxes. The negatives are placed with "blind" positives and soldered up; these negatives are then subjected to the "reducing" process for a period of about three to four days.

The positives again are packed into similar forming boxes with "formed" or "partially formed" negatives and then soldered up; the red lead paste is converted into peroxide, and this process lasts two days. The connections of the positives and negatives have to be unsoldered again, the plates must be unpacked, and this, with the double method of "forming," causes much expenditure of time, labor, and material. The value of this labor is estimated at 10 per cent. on the prime cost of the battery. We regret that, owing to Mr. Reckenzaun's presence in America, we cannot offer our readers any data compiled from actual tests of the cells, but from casual figures obtained with a battery which has been in operation for a period of something like 18 months, and from personal inspection at intervals, we have every reason to believe that a distinct and important advance in secondary battery construction is here shown.

It is most essential that a cheap, reliable, and durable accumulator should be forthcoming for the purposes of electric locomotion, and this we think Mr. Reckenzaun has produced.

It stands to reason that if the electrical propulsion of tram-cars is to become more general—and who can doubt that this will eventually be the case?—there must be a point where the conductor system, be it overheard or in conduits, is no longer admissible, and here it is that the accumulator must step in.

To make our meaning still plainer, the loss on a conductor increases with the length of the line, whereas the loss in the transformation of electrical energy from dynamo to battery and from battery to motor remains a constant, no matter how long the tramway. It would be very interesting if some of our electrical engineers would enter into this question, and show for what distances properly proportioned conductor systems are less costly than the self-contained car with secondary batteries and at what point the latter bears off the palm.—*London Electrical Review.*

The Brooklyn City Railroad May Do Away with Horse Cars.

The Brooklyn City Railroad does not intend to get left. Even though the Kings County Elevated people control the air, the surface road still has possession of the earth, and President Lewis would like to know what is going to prevent him from substituting electricity or some other motive power for horses on Fulton and Flatbush avenues. The law requires the company to get the consent of two-thirds of the property owners before any change can be made in the motive power. At this point Secretary Thompson steps in, and waving a document, says: "We have already got the consent of two-thirds of the property owners on Fulton and Flatbush avenues." What will the next step be? The surface people will wait and see if the receipts fall off materially when the elevated is in running order before proceeding any further. In the meantime they control the earth and possess the consent of two-thirds of the property owners on Fulton and Flatbush avenues.

Late London Electric Incorporations.

August 31. Cowles Electric Smelting and Aluminium Company, of Cleveland, Ohio, U. S. A. Capital, £150,000, in £10 shares. Object—To purchase patent and carry on business of separators and refiners by electrolysis. Edwin Cowles, of Cleveland, U.S.A., is one of the directors.

August 26. London Electric Supply Corporation. Capital, £1,000,000, in £5 shares. Object—To supply electricity for lighting and other purposes within the London postal district on an agreement with Sir Couts Lindsay & Co. (Limited).

August 26. Northern Electrical Engineering Company (Limited). Capital, £25,000, in £1 shares. Object—To purchase the business of F. H. Perry & Co. and H. I. Marshall & Co.

August 29. Universal Electric Company (Limited). Capital, £50,000, in £5 shares. Object—To carry on in any part of the world electric light business in all its branches.

The Subway Commssion Can't Do It.

Recently Judge Bartlett, of the Supreme Court, refused a mandamus to the Edison Company to compel the Brooklyn Subway Commissioners to grant a permit to it to tear up the streets and lay its wires underground. "I do not find," says the Judge, "in the statute creating the said Board anything to indicate that the Legislature intended to confer upon it the power to grant to any individual or corporation a franchise to occupy the public streets. Such power is not conferred in express terms anywhere in the statute, and it is not necessarily one of the Board's implied powers."

Couldn't Patronize the Enemy.

"Doctor," he said to a Topeka dentist, "I have a horrible toothache; can you pull out this fang without pain?"

"Certainly, sir."

"How'll you manage it?"

"I'll administer gas."

"That won't do. I'm interested in the electric light plant."

—— For running printing presses electric motors are already in great favor, and are now used in a number of newspaper offices. The Detroit *Daily Tribune* is regularly printed by electric motor power, and motors may be found in the offices of the Lowell *Daily News* and *Daily Courier*, the Lawrence, Mass., *American*, the Elgin, Ill., *News*, and the local papers at Abilene and Hutchinson, Kan., and elsewhere.

—— The enterprising A., T. & S. F. Ry. management has given the Pullman Car Company an order for eight trains, each to consist of seven cars—two Pullman, two coaches, a smoker, a baggage, and an express. These are to be finished by the first of May next, and then will be run as through trains from Chicago to Los Angeles. Each car is to be fitted up in the highest style of the art known to car builders, and the Pullmans are to be lighted by electricity. The time from Chicago to Los Angeles will be three and a half days.

—— Messrs. Warren & Shain, of the U. S. Electric Lighting Company, Chicago, were New York visitors last week.

—— A method of regulating the speed of gas and other engines for driving dynamos has been devised by M. Menges. In this system the supply of gas to the motor is controlled electrically by means of a solenoid coupled up with the lamps, either in series or in parallel, according as a constant potential or a constant current service is required. A soft iron core is placed in the solenoid, and any variation of the current in the latter causes a corresponding change in the position of the core. The core is connected by a lever to the gas valve, the opening through which is thus varied *pari passu* with the current through the coil. This is so arranged that the greater the load on the dynamo the wider is the gas valve opened, with the curious result that the speed of the engine is greater under high loads than under low.

PLATE OF RECKENZAUN'S NEW STORAGE BATTERY.

—— The National Pipe Bending Company, of New Haven, Conn., report that their sales of the National feed-water heaters for the months of July and August are the largest since their establishment in business. Among the sales in August were one 150 horse power electric light station, South Framingham, Mass; one 400 horse power to Little Rock, Ark.; one 100 horse power, Chicago, Ill.; one 200 horse power, J. W. Green, Danbury, Ct.; one 200 horse power to Boston, Mass.; one 60 horse power to electric light station, Sterling, Kan.; one 60 horse power electric light station, Nickerson, Kan.; one 150 horse power electric light station, Southbridge, Mass.; one 300 horse power, El Paso Electric Light Company, Colorado Springs, Cal; one 500 horse power to Electric Light Company, Springfield, Mass.; one 800 horse power, Electric Light Company, Grand Rapids, Mich.; one 400 horse power, Water, Light and Telephone Company, Hutchinson, Kan.; one 300 horse power to Piedmont, S. C.; one 300 horse power to Lawrence Gas Company, Lawrence, Mass.; one 100 horse power to Wichita Electric Light Company, Wichita, Kan.; one 800 horse power to Detroit, Mich.

Lighting Exhibition at St. Petersburgh.

The Imperial Russian Technical Society is to hold an exhibition of lighting appliances at St. Petersburgh towards the end of the current year. The programme will include: (*a*) Historical collections of apparatus and materials serving for lighting in ancient times. (*b*) Lighting by solid and liquid materials of vegetable and animal origin. (*c*) Gas lighting materials, and apparatus for its manufacture and use. (*d*) Lighting by electricity. (*e*) Special sources of light. (*f*) Lamps for burning mineral oils. (*g*) Photometry. (*h*) Mineral oils and their derivatives. Apparatus and contrivances for procuring, preserving, transporting, and treating mineral oils. (*i*) Heating apparatus fed by mineral oils and their derivatives. (*j*) Mineral oils for lubricating.

ELECTRIC LIGHT NEWS

—— The Thomson-Houston company's franchise for lighting Chicopee, Mass., has been transferred to the Chicopee Electric Light Company.

—— Mr. Frank P. Blair, of St. Paul, has adopted the electric light for a large flat building, and will use 300 lights of the Mather system, contracting through the Chicago office, J. H. Reid, manager.

—— The works of the American Company will in January be combined under one roof at New Haven, Conn., while the business offices will be continued at 18 Cortlandt street, New York, and 107 Congress street, Boston.

—— The Leatheroid Company, of Boston (74 Bedford street), is doing a fine business with the electrical manufactories. Leatheroid is found to answer for a great many things in which much more expensive material was heretofore used. It is manufactured in all thicknesses.

—— The mayor and aldermen of Jackson, Tenn., have just accepted a proposition from the Jackson Citizens' Gaslight Company, to furnish the city twenty-five electric lights for five years, at $80 per annum for each light. The company agrees to have the city illuminated by Christmas.

—— It is said that electric light will turn paper very yellow. This discoloration occurs only with paper containing ligneous substances, such as wood, straw and jute, and that it does not take place when, through some chemical process, the lignine that forms the essential part of the wood is removed. The yellowing is due to a phenomenon of oxidation.

—— Since the Thomson-Houston Electric Light Company commenced operations in Augusta, Ga., the old company have pulled themselves together, and are now working up the city systematically. They are putting in new lights almost daily, and are doing a thriving business. They have been engaged for the past two weeks in putting up a half inch wire for their incandescent lights. It will be the Edison three-wire system.

—— The Thomson-Houston Electric Light and Power Company, recently organized in Buffalo, is pushing things with a will, and already promises to be a lively competitor for business in its line. The company have bought the property at the corner of Pearl and Court streets, adjoining the Court Street Theater, and intend locating their station at that point. The lot is a large one, and the buildings upon it at present will be torn down and a suitable structure erected. The company will start with a large plant.

—— The works of the Norristown (Pa.) Gas Company were erected in 1852, and the gas is distributed through 16 miles of pipes to the residents of Norristown and the adjacent town of Bridgeport. The buildings and machinery are of a substantial character, and the value of the plant, etc., is $150,000. The capacity of the works can be depended on to supply a monthly output of about 15 millions cubic feet. Next comes the Norristown Electric Light and Power Company, which is officered as follows: President, I. H. Brendlinger; secretary and treasurer, W. F. Solly. The company supplies both arc and incandescent lights, the Thomson-Houston and the Edison systems being followed. The third occupant of the lighting field is the Norristown Electric Light, Heat, and Power Company, with S. P. Hanson as president; Dr. T. A. Foster, secretary; and R. Sheetz, treasurer. The company employs the Excelsior system of electrical supply. The conclusion must be reached that Norristown is abundantly supplied with dispensers of artificial light.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPT 13, 1887.

369,672 Electric alarm clock; Amos G. Woolley Cincinnati, Ohio, assignor of two-thirds to Richard Woolley, jr., and Edgar M. Woolley, both of same place.

369,754 Dynamo-electric machine or motor; Elihu Thomson, Lynn, Mass.

369,769 Galvanic battery; Horatio J. Brewer, New York, N. Y.

369,793 Manufacture of insulated electrical conductors; John T. Jaques, Boston, Mass., assignor to the Faraday Electric Cable Company.

369,801 Electric valve controller; William H. Markland, Brooklyn, N. Y., assignor, by mesne assignments, to the Tucker Electrical Manufacturing Company, of New York.

369,808 Electric call bell; Joseph G. Noyes, New York, N. Y., assignor to the New Haven Clock Company, same place.

369,810 Electrical annunciator call system; F. Jarvis Patten, Fort Sidney, Neb.

369,813 Underground conduit for electric wires; Gustav Rader, New York, N. Y.

369,880 Railway telegraph; Lucius J. Phelps, New York, N. Y.

369 889 Electrical cut-out; Nolton F. Stoddard, Detroit, Mich., assignor to the Markle Engineering Company, same place.

369.917 Governor for electro-magnetic brake circuits; George F. Card, Covington, Ky., assignor to Henry K. Lindsey, Cincinnati, Ohio.

369,929 Electric railway signal; J. Hamilton Farrar, Chicago, Ill.

369,954 Automatic reverse movement and spacing mechanism for electrical and mechanical type-writers; James F. McLaughlin, Philadelphia, Pa.

369,989 Electric bell; Hans P. F. Jensen, Browne W. Webb and Jens Jensen, London, county of Middlesex, England.

370,000 Regulation of electric motors; Schuyler S. Wheeler, New York, N. Y., assignor to the C. & C. Electric Motor Company, same place.

370,007 Electric heat regulating apparatus; Wm. A. Connelly, Boston, Mass.

PATENTS.

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"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court (7 Beekman St.,) New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World's* Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend." —*New York Observer*.

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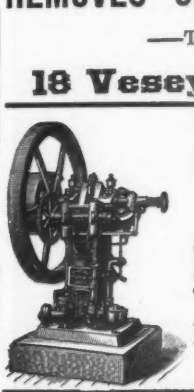

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